REPORT OF
AIR POLLUTION SOURCE TESTING
OF AN ETHYLENE OXIDE EMISSION-CONTROL SYSTEM
OPERATED BY STERIGENICS, INC.
IN ONTARIO, CALIFORNIA
ON DECEMBER 9, 2016

Submitted to:

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
21865 East Copley Drive
Diamond Bar, California 91765-4182

Submitted by:

STERIGENICS, INC.
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SCAQMD Facility ID 126060

Prepared by:

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January 20, 2017

ECSi

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SCAQMD Permit Number F96410 (Catalytic Oxidizer)

TEST DATE

Friday, December 9, 2016

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1.0 INTRODUCTION

On Friday, December 9, 2016, ECSi, Inc. performed annual air pollution source testing and semi-annual leak testing of an ethylene oxide (EtO) sterilization and emission-control system operated by Sterigenics, Inc. in Ontario, California. The control device tested included one Donaldson Abator catalytic oxidizer, which is currently used to control emissions from eight commercial ethylene oxide sterilizer backvents, and one aeration room. The purpose of the testing program was to evaluate continued compliance with South Coast Air Quality Management District (SCAQMD) Rule 1405, the conditions established in the permit (F96410) granted to Sterigenics, Inc. by the SCAQMD, and with the work practice provisions in 40 CFR 63.363(b)(4)(i).

2.0 EQUIPMENT

The EtO gas-sterilization system is comprised of eight commercial sterilizers, all discharging through liquid-ring vacuum pumps to an existing packed-tower acid scrubber emission control device. The sterilization chamber backvents for all chambers discharge to the aeration room, which discharges to a Donaldson EtO Abator catalytic oxidizer emission-control device. The gas-sterilization and emission-control equipment consists of the following:

- Six identical Trumbo/Xytel Gas Sterilizers, each comprised of a heated 2460 cubic foot interior volume sterilization chamber, a recirculating vacuum pump chamber evacuation system, and a backvent valve

- Two identical Trumbo/Xytel Gas Sterilizers, each comprised of a heated 5300 cubic foot interior volume sterilization chamber, a recirculating vacuum pump chamber evacuation system, a backvent valve, and a fugitive emissions exhaust hood

- One aeration room, comprised of a heated aeration chamber and a chamber exhaust/vent system.

Sterilizer vacuum pump emissions are controlled by:

- One Ceilcote packed tower chemical scrubber, Model SPT-48-168, 4'-0" diameter and 23'-4" high, equipped with a 14' deep bed of No. 1 Tellerette packing, a 5000 gallon reaction tank with two 10 hp/ 151 gpm recirculating pumps (one standby), and a 3 hp/2000 cfm exhaust fan.

Sterilizer backvent and aeration emissions are controlled by:

- One Donaldson EtO Abator System, 25,000 SCFM, equipped with a prefilter, a gas-fired heater, an exhaust gas heat exchanger, a reactive catalyst bed, and an exhaust blower.

3.0 TESTING

EtO source testing was conducted in accordance with the procedures outlined in CARB Method 431 and USEPA CFR40, Part 63.365. EtO emissions monitoring was conducted simultaneously at the inlet and outlet of the Abator during the entire backvent duration of one of the eight sterilizers, and during three one-hour time intervals of the aeration process.

During backvent/aeration testing, EtO emissions at the inlet and the outlet of the catalytic oxidizer were determined using direct source sample injection into the gas chromatograph (GC). All backvent and aeration testing was performed using freshly sterilized product.

4.0 RULE/COMPLIANCE REQUIREMENTS

The EtO gas-sterilization system at Sterigenics, Inc. was tested to evaluate compliance with the conditions specified in the SCAQMD Permit, and with the requirements outlined in SCAQMD Rule 1405. The current testing was performed to demonstrate continued compliance with the following requirements:

- The backvent valve discharge stream must be vented to control equipment with an EtO emission-reduction efficiency of at least 99.0% by weight;

- The aeration discharge stream must be vented to control equipment with an EtO emission-reduction efficiency of at least 99.0% by weight;

Testing is required to demonstrate compliance with these requirements. Source testing of the emission-control device is required initially, and is required annually thereafter.

5.0 TEST METHOD REFERENCE

5.1 INTRODUCTION

EtO source testing was conducted in accordance with the procedures outlined in CARB Method 431 and USEPA CFR40, Part 63.365. EtO emissions monitoring was conducted simultaneously at the inlet and outlet of the Abator during the entire backvent duration of one of the eight sterilizers, and during three one-hour time intervals of the aeration process.

During backvent/aeration testing, EtO emissions at the inlet and the outlet of the catalytic oxidizer were determined using direct source sample injection into the gas chromatograph (GC). All backvent and aeration testing was performed using freshly sterilized product.

Operation and documentation of process conditions were performed by personnel from Sterigenics, Inc. using existing monitoring instruments installed by the manufacturer of the equipment to be tested. In accordance with SCAQMD requirements, and the procedures established in USEPA CFR40, Part 63, Subpart O, catalyst bed operating temperature was recorded, and is presented in Tables 1 and 2.

5.2 VOLUMETRIC FLOW MEASUREMENT

Exhaust gas flow at the outlet of the Abator was determined by EPA Method 2C using a standard pitot tube and an inclined-oil manometer. Sampling ports were installed in accordance with EPA Method 1, and are located far enough from any flow disturbances to permit accurate flow measurement.

Temperature measurements were obtained from a type K thermocouple and thermometer attached to the sampling probe. Exhaust gas composition was assumed to be air and small amounts of water vapor. Water vapor was negligible, at about 3 percent.

5.3 CONTROL EFFICIENCY AND MASS EMISSIONS MEASUREMENT

During backvent and aeration testing, EtO emissions at the inlet and outlet of the catalytic oxidizer were determined using direct source sample injection into the GC. The mass of EtO emitted to the inlet and from the outlet were determined using the equation shown below in Section 5.9. Mass-mass control-efficiency of EtO during the backvent and aeration phases was calculated by comparing the mass of EtO vented to the system inlet to the mass of EtO vented from the system outlet.

During the backvent and aeration phases, vented gas was analyzed by an SRI, Model 8610, portable gas chromatograph (GC), equipped with the following: dual, heated sample loops and injectors; dual columns; and dual detectors. A flame ionization detector (FID) was used to quantify inlet EtO emissions, and a photoionization detector (PID) was used to quantify low-level EtO emissions at the emission-control device outlet.

5.4 SAMPLE TRANSPORT

Source gas was pumped to the GC at approximately 500-1000 cubic centimeters per minute (cc/min) from the sampling ports through two lengths of Teflon® sample line, each with a nominal volume of approximately 75 cubic centimeters (cc) and an outer diameter of 0.25 inch. At the inlet of the catalytic oxidizer, the sampling port was located in the common backvent/aeration discharge duct, upstream of the oxidizer. At the outlet of the catalytic oxidizer, sampling ports were located in the exhaust stack downstream of the catalyst bed.

5.5 GC INJECTION

Source-gas samples were injected into the GC which was equipped with two heated sampling loops, each containing a volume of approximately 2cc and maintained at 100 degrees Celsius (C). Injections occurred at approximately one-minute intervals during backvent testing, and at approximately five-minute intervals during aeration testing. Helium was the carrier gas for both the FID and PID.

5.6 GC CONDITIONS

The packed columns for the GC were operated at 90 degrees C. The columns were stainless steel, 6 feet long, 0.125 inch outer diameter, packed with 1 percent SP-1000 on 60/80 mesh Carbopack B.

During the analysis, the FID was operated at 250 degrees C. The support gases for the FID were hydrogen (99.995% pure) and air (99.9999% pure). Any unused sample gas was vented from the GC system back to the inlet of the control device being tested.

5.7 CALIBRATION STANDARDS

The FID was calibrated for mid-range part-per-million-by-volume (ppmv) level analysis using gas proportions similar to the following:

1) 100 ppmv EtO, balance nitrogen
2) 50 ppmv EtO, balance nitrogen (audit gas)
3) 10 ppmv EtO, balance nitrogen
4) 1 ppmv EtO, balance nitrogen

The PID was calibrated for low-range ppmv level analysis using gas proportions similar to the following:

1) 100 ppmv EtO, balance nitrogen
2) 50 ppmv EtO, balance nitrogen (audit gas)
3) 10 ppmv EtO, balance nitrogen
4) 1 ppmv EtO, balance nitrogen

Each of these calibration standards was in a separate, certified manufacturer's cylinder. Copies of the calibration gas laboratory certificates are attached as Appendix E.

5.8 SAMPLING DURATION

Sampling was performed during the entire backvent duration of one of the eight sterilizers, and during three one hour time intervals of the aeration process.

Backvent testing was performed with freshly sterilized product in the sterilization chamber, upon initial opening of the backvent valve at the conclusion of the sterilizer vacuum vent phase. All aeration testing was performed with freshly sterilized product in the aeration rooms.

5.9 CONTROL-EFFICIENCY/MASS-EMISSIONS CALCULATIONS

Mass emissions of EtO during the backvent and aeration phases were calculated using the following equation:

$$MassRate = (VolFlow)(MolWt)(ppmv\ EtO/10^6)/(MolVol)$$

Where:

MassRate	=	EtO mass flow rate, pounds per minute
VolFlow	=	Corrected volumetric flow rate, standard cubic feet per minute at 68 degrees F
MolWt	=	44.05 pounds EtO per pound mole
ppmv EtO	=	EtO concentration, parts per million by volume
10^6	=	Conversion factor, ppmv per "cubic foot per cubic foot"
MolVol	=	385.32 cubic feet per pound mole at one atmosphere and 68 degrees F

Mass-mass control efficiency of EtO was calculated for the backvent/aeration. Results of the control-efficiency testing are presented in Section 8.0 and Tables 1 and 2.

5.11 LEAK TESTING

Testing for EtO leaks was conducted by CARB Method 21 in accordance with SCAQMD Rule 1405. Testing was conducted during the exposure and chamber evacuation phases of the sterilization and exhaust cycles of the sterilizer. These conditions represent maximum sterilant gas mass flow through the system.

EtO leak testing was performed using a Bacharach EO Leakator, Part Number 19-7057, Gas Leak Detector, equipped with a metal-oxide semi-conductor sensor, an audible signal, and a visual display. The lower detection limit of the instrument is less than the leak definition specified for EtO in SCAQMD Rule 1405. This leak definition is 10 ppm EtO for sterilant gas composed of 100 percent EtO.

EtO concentration was measured one centimeter from the surface of all accessible components of the sterilizer and emission-control device that are potential sources of EtO leakage. Each component found to be leaking was identified and tagged. The date and the results of the EtO measurement for each leaking component were entered on that component's tag. The leak test data is summarized in Section 8.0 and in Table 3.

6.0 TEST SCENARIO

The emission-control device was tested under conditions of the maximum EtO mass flow to the emission-control device under normal operating conditions. The maximum EtO mass flow to the emission-control device was achieved by testing the sterilizer through its entire backvent phase and through three one-hour intervals of the 24-hour/day aeration process, with freshly sterilized product in aeration.

7.0 QA/QC

7.1 FIELD TESTING QUALITY ASSURANCE

At the beginning of the test, the sampling system was leak checked at a vacuum of 15 inches of mercury. The sampling system was considered leak free when the flow indicated by the rotameters fell to zero.

At the beginning of the test, a system blank was analyzed to ensure that the sampling system was free of EtO. Ambient air was introduced at the end of the heated sampling line and drawn through the sampling system line to the GC for analysis. The resulting chromatogram also provided a background level for non-EtO components (i.e. ambient air, carbon dioxide, water vapor) which are present in the source gas stream due to the ambient dilution air which is drawn into the emission-control device, and due to the destruction of EtO by the emission-control device which produces carbon dioxide and water vapor. This chromatogram, designated AMB, is included with the calibration data in Appendix A.

7.2 CALIBRATION PROCEDURES

The GC system was calibrated at the beginning and conclusion of each day's testing. Using the Peaksimple II analytical software, a point-to-point calibration curve was constructed for each detector. A gas cylinder of similar composition as the calibration gases, but certified by a separate supplier, was used to verify calibration gas composition and GC performance.

All calibration gases and support gases used were of the highest purity and quality available. A copy of the laboratory certification for each calibration gas is attached as Appendix E.

8.0 TEST RESULTS

The Donaldson EtO Abator demonstrated an EtO control efficiency of 99.980 percent for the control of aeration emissions, and 99.982 percent for the control of backvent emissions. SCAQMD Rule 1405 specifies that EtO emission-control devices, at gas sterilization facilities with EtO usage in the range of Sterigenics, Inc., must have an EtO control efficiency of 99.0 percent or more during the aeration and backvent phases. The emission-control device met this requirement.

The entire gas sterilization and emission control system was also found to be leak free.

The test results are summarized in Table 1, 2 and 3. Chromatograms and chromatographic supporting data are attached as Appendices A through C. Copies of field data and calculation worksheets are attached as Appendix D.

TABLES

TABLE 1
ETHYLENE OXIDE CONTROL EFFICIENCY - AERATION OF AN ETHYLENE OXIDE EMISSION CONTROL DEVICE OPERATED BY STERIGENICS, INC. IN ONTARIO, CALIFORNIA ON DECEMBER 9, 2016

RUN NUMBER	INJECTION TIME	INLET ETO CONC. (PPM)(1)	OUTLET ETO CONC. (PPM)(2)	ETO CONTROL EFFICIENCY
1(3)	947	49.8	0.01	99.9799
1	952	48.3	0.01	99.9793
1	957	48.9	0.01	99.9796
1	1002	47.0	0.01	99.9787
1	1007	46.3	0.01	99.9784
1	1012	44.9	0.01	99.9777
1	1017	45.6	0.01	99.9781
1	1022	44.9	0.01	99.9777
1	1027	46.4	0.01	99.9784
1	1032	45.1	0.01	99.9778
1	1037	45.2	0.01	99.9779
1	1042	44.2	0.01	99.9774
2(4)	1110	57.3	0.01	99.9825
2	1115	55.8	0.01	99.9821
2	1120	56.3	0.01	99.9822
2	1125	56.0	0.01	99.9821
2	1130	57.4	0.01	99.9826
2	1135	58.8	0.01	99.9830
2	1140	56.4	0.01	99.9823
2	1145	56.0	0.01	99.9821
2	1150	51.5	0.01	99.9806
2	1155	50.0	0.01	99.9800
2	1200	49.7	0.01	99.9799
2	1205	52.1	0.01	99.9808
3(5)	1210	54.6	0.01	99.9817
3	1215	54.2	0.01	99.9815
3	1220	53.4	0.01	99.9813
3	1225	52.2	0.01	99.9808
3	1230	51.3	0.01	99.9805
3	1235	47.7	0.01	99.9790
3	1240	46.6	0.01	99.9785
3	1245	47.0	0.01	99.9787
3	1250	47.6	0.01	99.9790
3	1255	47.2	0.01	99.9788
3	1300	47.5	0.01	99.9789
3	1305	48.1	0.01	99.9792
TIME-WEIGHTED AVERAGE:		**50.31**	**0.0100**	**99.9800**
			SCAQMD REQUIRED CONTROL EFFICIENCY:	**99.0%**

Notes:
(1) - PPM = parts per million by volume
(2) - 0.01 ppm is the quantification limit for the detector used at the outlet.
(3) - Aeration Phase Test Run #1 started at 09:45, ended at 10:45.
(4) - Aeration Phase Test Run #2 started at 11:08, ended at 12:08.
(5) - Aeration Phase Test Run #3 started at 12:08, ended at 13:08.
(4) - The average catalyst bed temperature recorded during the test was 299 degrees F.

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TABLE 2
ETHYLENE OXIDE CONTROL EFFICIENCY - BACKVENT
OF AN ETHYLENE OXIDE EMISSION CONTROL DEVICE
OPERATED BY STERIGENICS, INC.
IN ONTARIO, CALIFORNIA
ON DECEMBER 9, 2016

CYCLE PHASE	INJECTION TIME	INLET ETO CONC. (PPM)(1)	OUTLET ETO CONC. (PPM)(2)	ETO CONTROL EFFICIENCY
Backvent(3)	1053	47.9	0.01	99.9791
Backvent	1054	48.4	0.01	99.9793
Backvent	1055	48.9	0.01	99.9796
Backvent	1057	51.8	0.01	99.9807
Backvent	1058	53.0	0.01	99.9811
Backvent	1059	58.8	0.01	99.9830
Backvent	1100	56.6	0.01	99.9823
Backvent	1101	55.9	0.01	99.9821
Backvent	1103	56.4	0.01	99.9823
Backvent	1104	58.3	0.01	99.9828
Backvent	1105	58.1	0.01	99.9828
Backvent	1106	56.8	0.01	99.9824
TIME-WEIGHTED AVERAGE:		**54.24**	**0.0100**	**99.9815**
			SCAQMD REQUIRED CONTROL EFFICIENCY:	**99.0**

Notes:
(1) - PPM = parts per million by volume
(2) - 0.01 ppm is the quantification limit for the detector used at the outlet.
(3) - The backvent phase test run started at 10:52, ended at 11:07.
(4) - The average catalyst bed temperature recorded during the test run was 299 degrees F.

APPENDICES

APPENDIX A

Calibration Data

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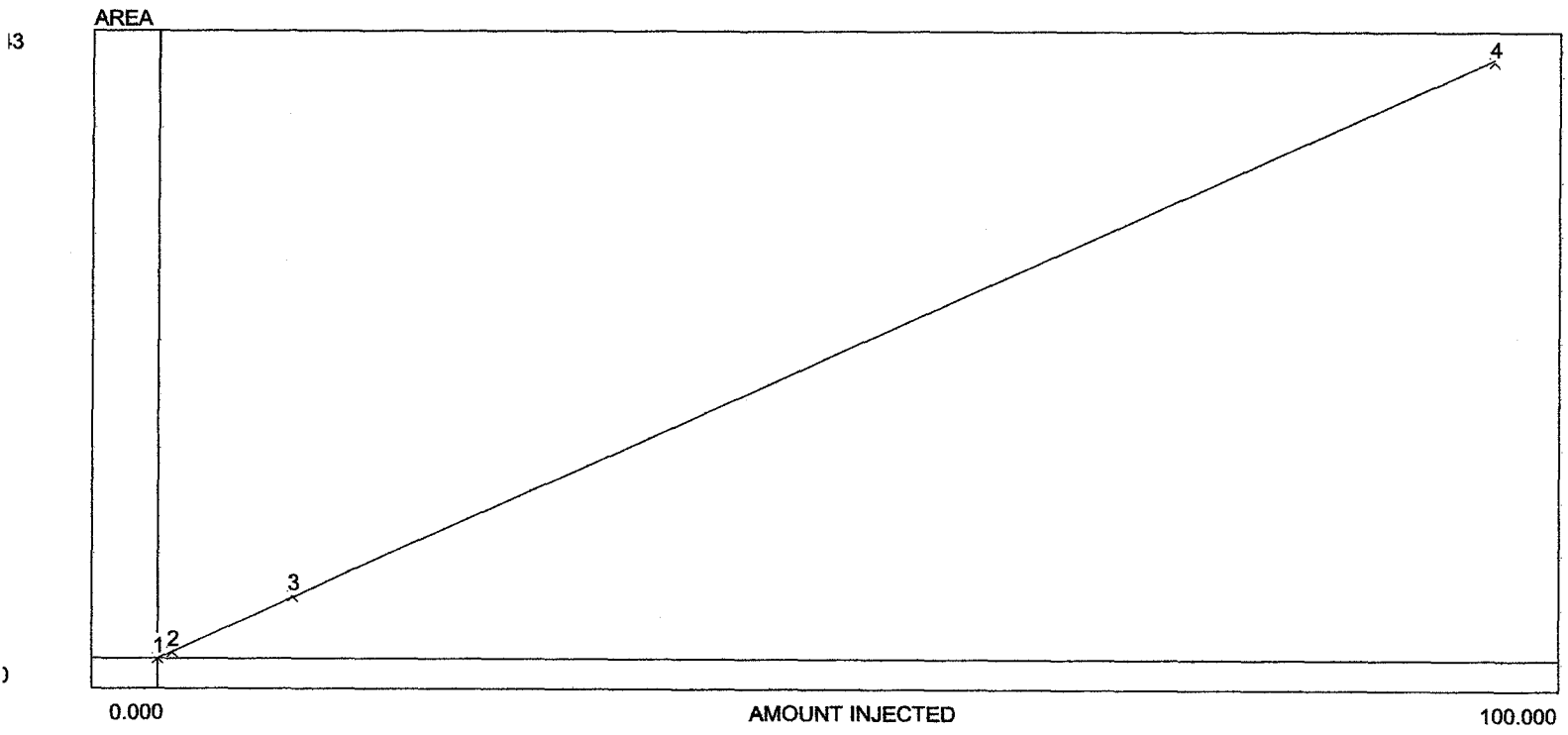
Component file: ctb1-100.cpt

Peak	Name	Start	End	Calibration	Int.Std	Units
1	Dead Vol / Air	0.000	0.350		0.000	
2	Ambient H2O	0.350	0.500		0.000	
3	Ethylene Oxide	0.500	0.600	C:\peak359\1Sten	0.000	16.ppm
4	Acetaldehyde	0.600	0.800		0.000	
5	CO2	0.800	1.000		0.000	

Calibration file: C:\peak359\1SterOnt2016.cal



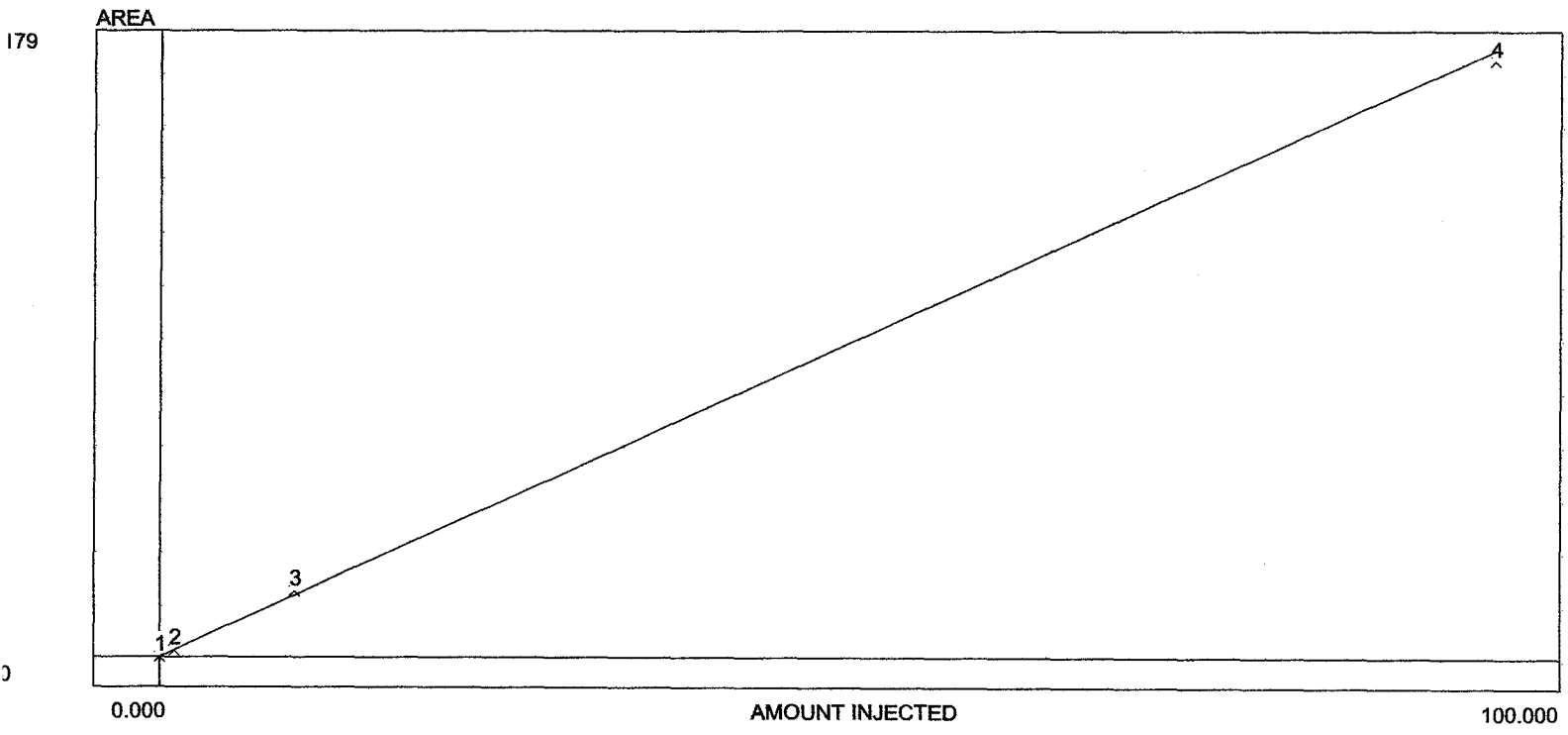
Avg slope of curve: 0.43
Y-axis intercept: 0.00
Linearity: 1.00
Number of levels: 4
SD/rel SD of CF's: 0.2/66.7
Y=0.4316X
r2: 1.0000
Last calibrated: Fri Dec 02 08:01:11 2016

Lvl.	Area/ht.	Amount	CF	Current	Previous #1	Previous #2
1	0.000	0.000	0.000	0.000	N/A	N/A
2	0.470	1.100	0.427	0.470	N/A	N/A
3	4.420	10.100	0.438	4.420	N/A	N/A
4	43.000	100.000	0.430	43.000	N/A	N/A

Component file: eto2-100.cpt

Peak	Name	Start	End	Calibration	Int.Std	Units
1	Dead Vol / Air	0.000	0.350		0.000	
2	Ambient H2O	0.350	0.500		0.000	
3	Ethylene Oxide	0.500	0.600	C:\peak359\2Ster	0.000	16.ppm
4	Acetaldehyde	0.600	0.800		0.000	
5	CO2	0.800	1.000		0.000	

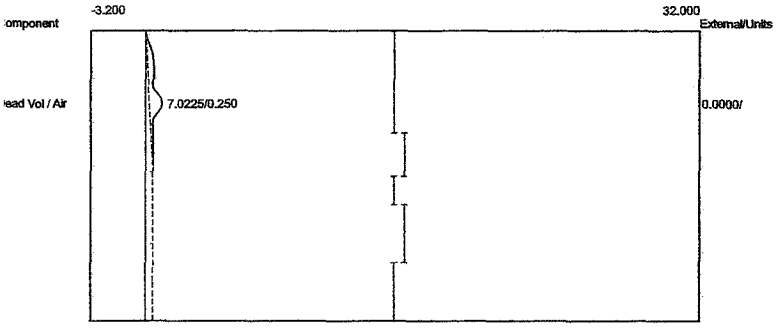
Calibration file: C:\peak359\2SterOnt2016.cal



Avg slope of curve: 1.82
Y-axis intercept: 0.00
Linearity: 1.00
Number of levels: 4
SD/rel SD of CF's: 0.9/67.0
Y=1.8223X
r2: 0.9999
Last calibrated: Fri Dec 02 08:00:23 2016

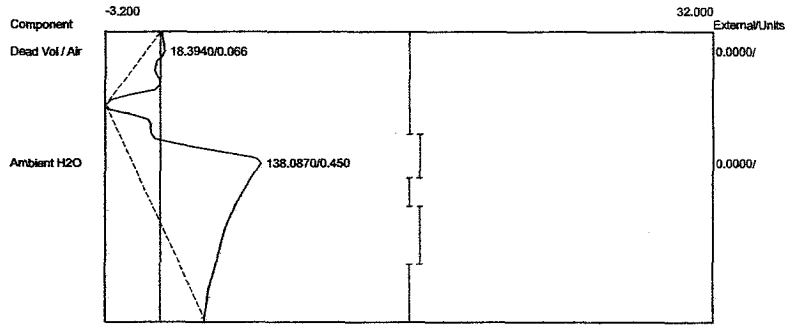
Lvl.	Area/ht.	Amount	CF	Current	Previous #1	Previous #2
1	0.000	0.000	0.000	0.000	N/A	N/A
2	1.910	1.100	1.736	1.910	N/A	N/A
3	19.600	10.100	1.941	19.600	N/A	N/A
4	179.000	100.000	1.790	179.000	N/A	N/A

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: PreCal
Analysis date: 12/08/2016 13:41:36
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-Amb.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.250	7.0225	0.0000	
		7.0225	0.0000	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: PreCal
Analysis date: 12/08/2016 13:41:36
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-Amb.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer

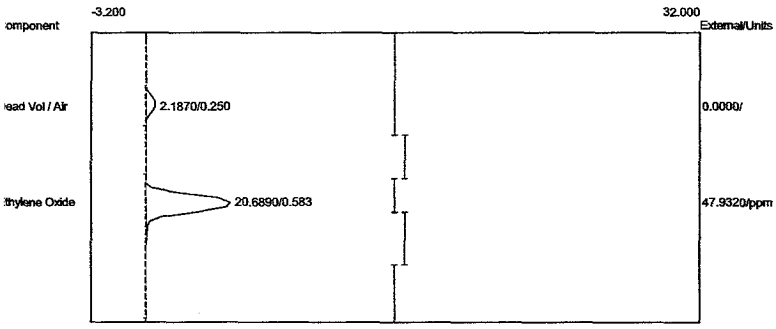


Component	Retention	Area	External	Units
Dead Vol / Air	0.066	18.3940	0.0000	
Ambient H2O	0.450	138.0870	0.0000	
		156.4810	0.0000	

APPENDIX B

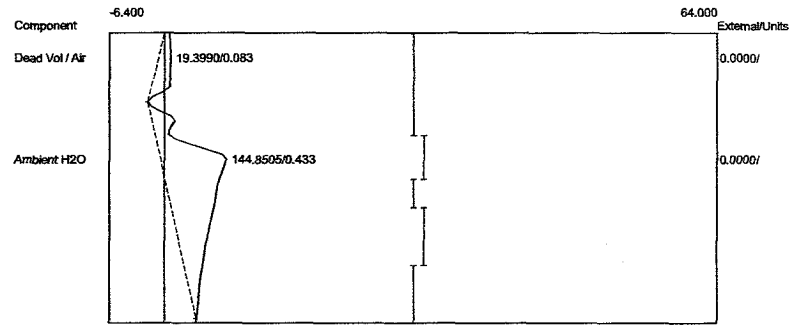
Backvent Chromatograms

Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 10:53:05
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-B01.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



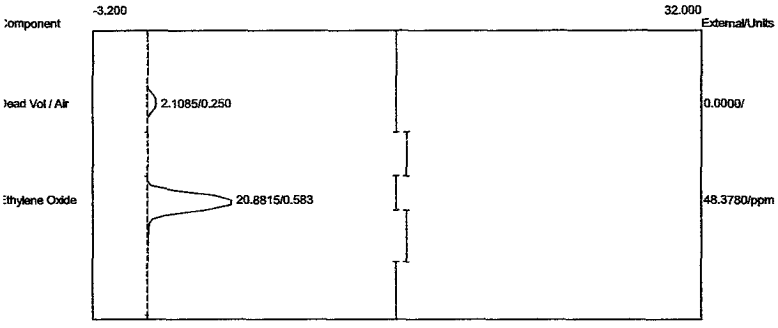
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.1870	0.0000	
Ethylene Oxide	0.583	20.6890	47.9320	ppm
		22.8760	47.9320	

Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 10:53:05
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-B01.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



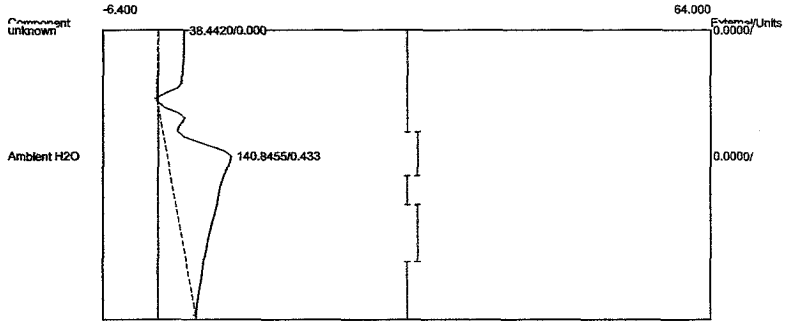
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	19.3990	0.0000	
Ambient H2O	0.433	144.8505	0.0000	
		164.2495	0.0000	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 10:54:18
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-B02.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



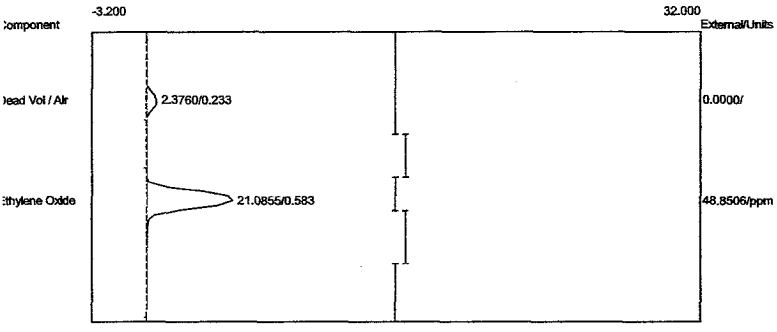
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.1085	0.0000	
Ethylene Oxide	0.583	20.8815	48.3780	ppm
		22.9900	48.3780	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 10:54:18
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-B02.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



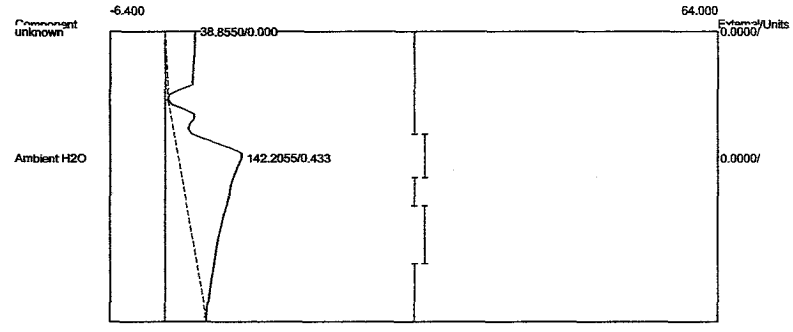
Component	Retention	Area	External	Units
Ambient H2O	0.433	140.8455	0.0000	
		140.8455	0.0000	

Lab name: ECS
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 10:55:33
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-B03.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



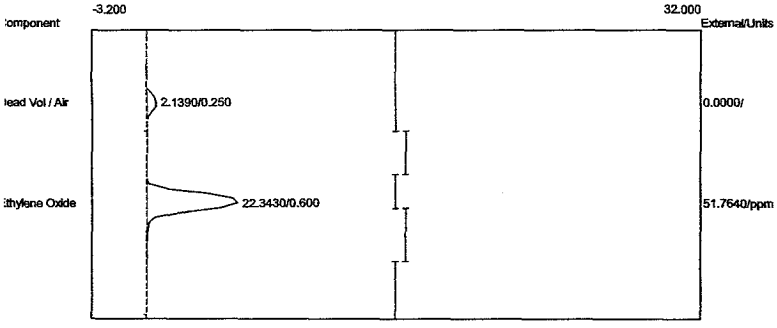
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.3760	0.0000	
Ethylene Oxide	0.583	21.0855	48.8506	ppm
		23.4615	48.8506	

Lab name: ECS
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 10:55:33
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-B03.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



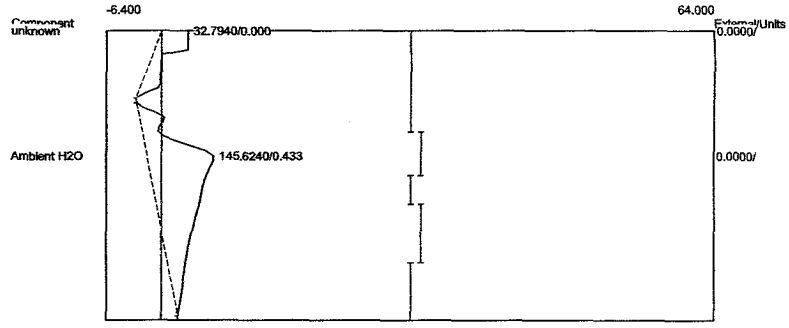
Component	Retention	Area	External	Units
Ambient H2O	0.433	142.2055	0.0000	
		142.2055	0.0000	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 10:57:11
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-B04.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



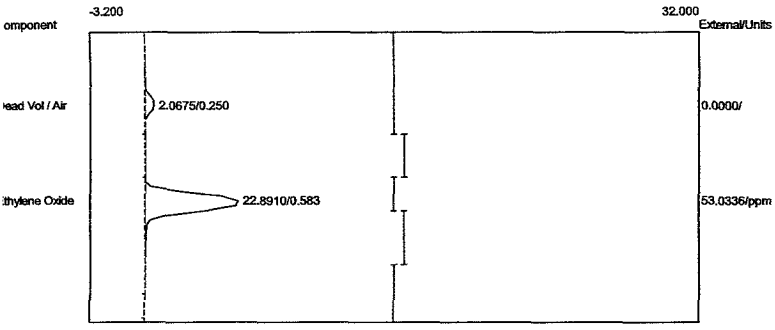
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.1390	0.0000	
Ethylene Oxide	0.600	22.3430	51.7640	ppm
		24.4820	51.7640	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 10:57:11
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-B04.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



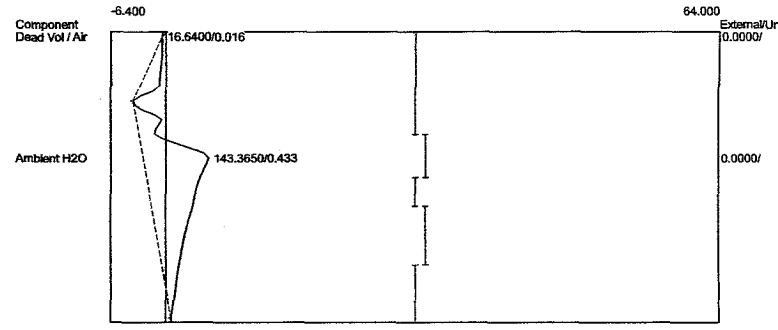
Component	Retention	Area	External	Units
Ambient H2O	0.433	145.6240	0.0000	
		145.6240	0.0000	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 10:58:19
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-B05.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



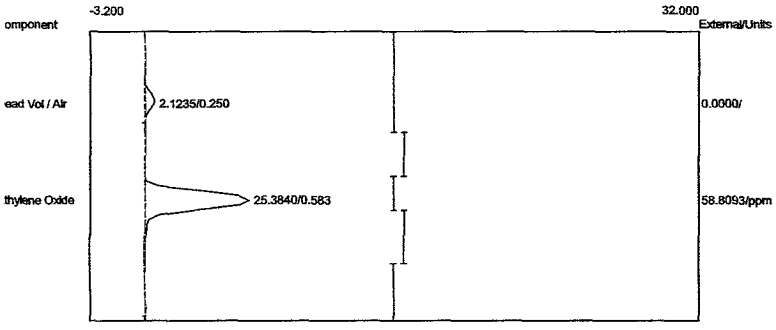
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.0675	0.0000	
Ethylene Oxide	0.583	22.8910	53.0336	ppm
		24.9585	53.0336	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 10:58:19
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-B05.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



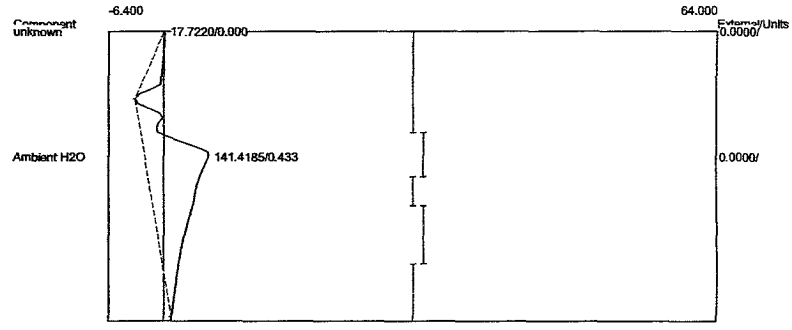
Component	Retention	Area	External	Units
Dead Vol / Air	0.016	16.6400	0.0000	
Ambient H2O	0.433	143.3650	0.0000	
		160.0050	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 10:59:24
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-B06.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



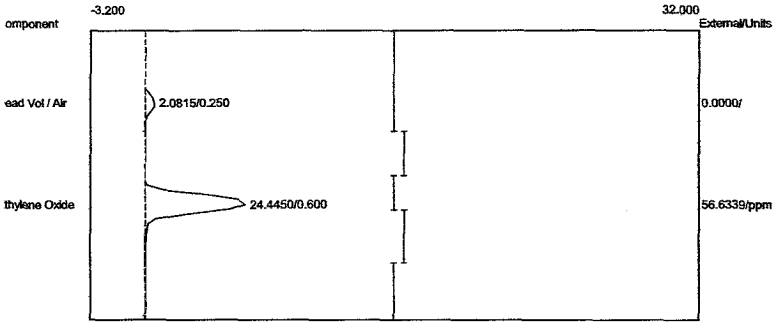
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.1235	0.0000	
Ethylene Oxide	0.583	25.3840	58.8093	ppm
		27.5075	58.8093	

Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 10:59:24
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-B06.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



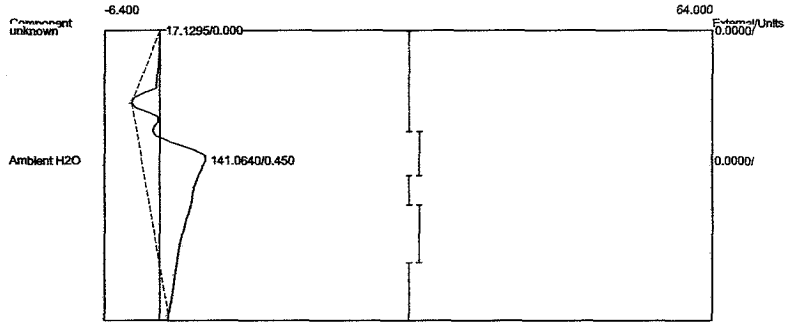
Component	Retention	Area	External	Units
Ambient H2O	0.433	141.4185	0.0000	
		141.4185	0.0000	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 11:00:36
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-B07.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



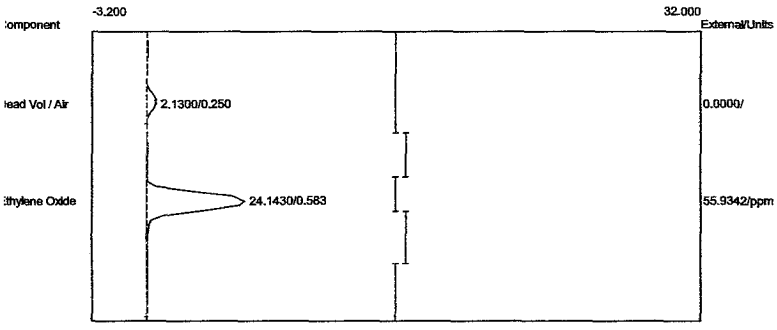
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.0815	0.0000	
Ethylene Oxide	0.600	24.4450	56.6339	ppm
		26.5265	56.6339	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 11:00:36
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-B07.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



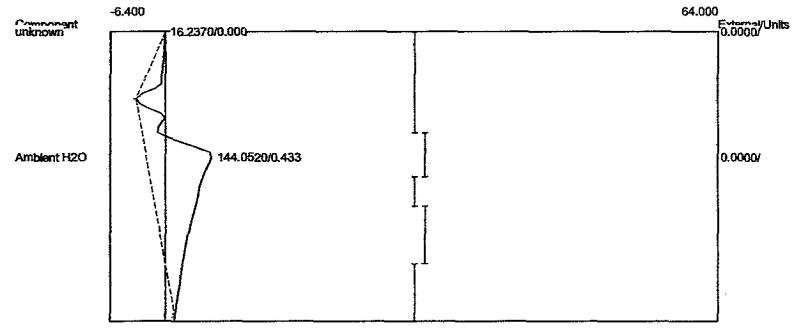
Component	Retention	Area	External	Units
Ambient H2O	0.450	141.0640	0.0000	
		141.0640	0.0000	

Lab name: ECS
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 11:01:49
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-B08.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



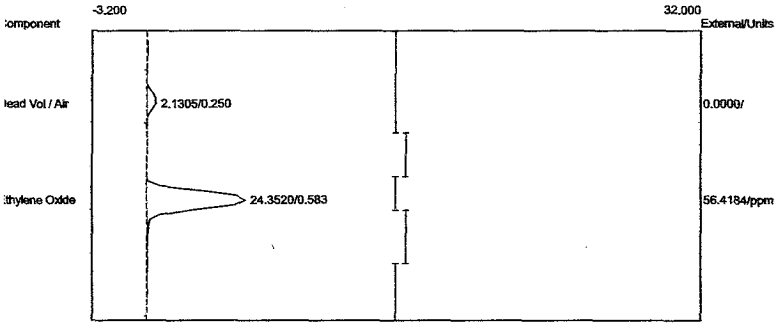
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.1300	0.0000	
Ethylene Oxide	0.583	24.1430	55.9342	ppm
		26.2730	55.9342	

Lab name: ECS
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 11:01:49
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-B08.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



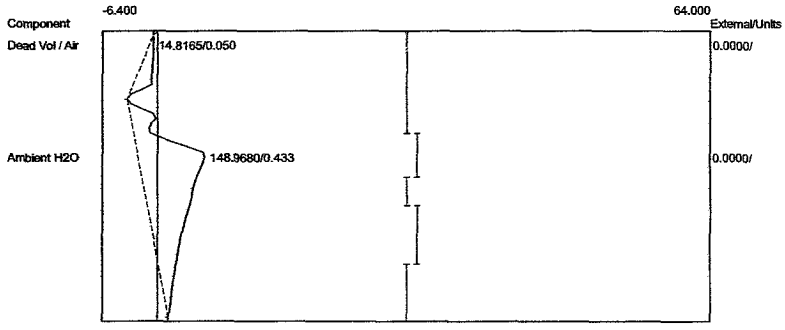
Component	Retention	Area	External	Units
Ambient H2O	0.433	144.0520	0.0000	
		144.0520	0.0000	

Lab name: ECC
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 11:03:21
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-B09.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



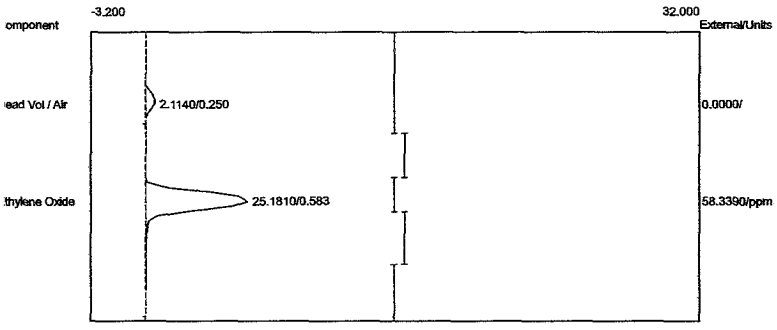
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.1305	0.0000	
Ethylene Oxide	0.583	24.3520	56.4184	ppm
		26.4825	56.4184	

Lab name: ECC
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 11:03:21
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-B09.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



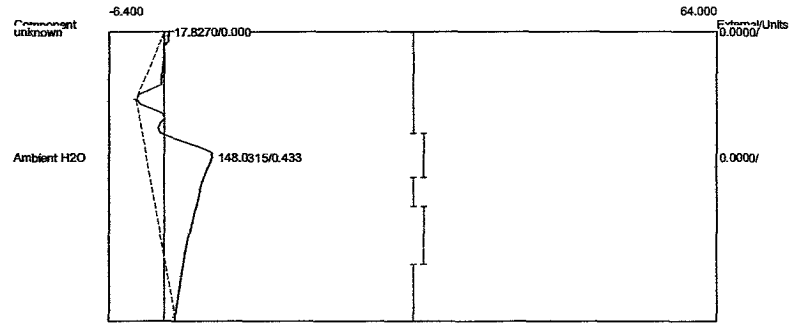
Component	Retention	Area	External	Units
Dead Vol / Air	0.050	14.8165	0.0000	
Ambient H2O	0.433	148.9680	0.0000	
		163.7845	0.0000	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 11:04:34
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-B10.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



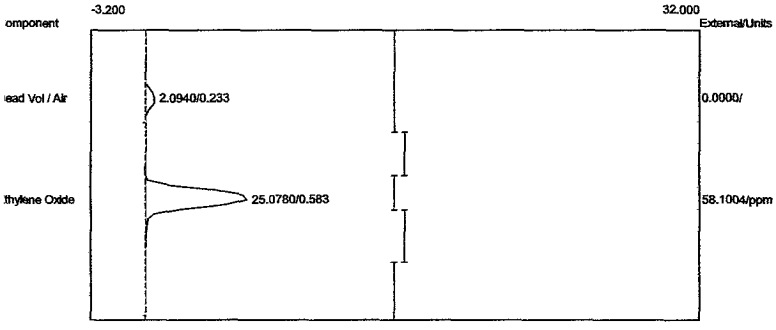
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.1140	0.0000	
Ethylene Oxide	0.583	25.1810	58.3390	ppm
		27.2950	58.3390	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 11:04:34
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-B10.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



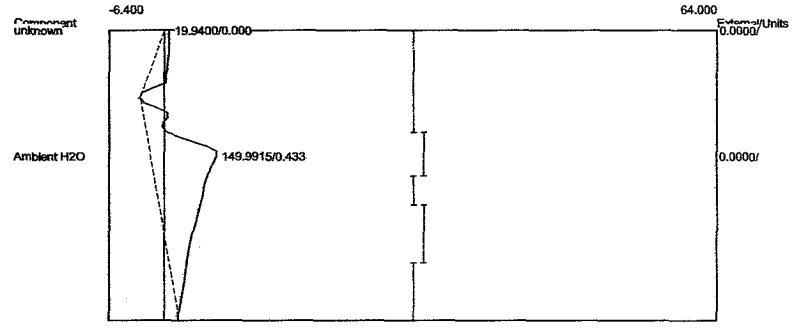
Component	Retention	Area	External	Units
Ambient H2O	0.433	148.0315	0.0000	
		148.0315	0.0000	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 11:05:45
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-B11.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



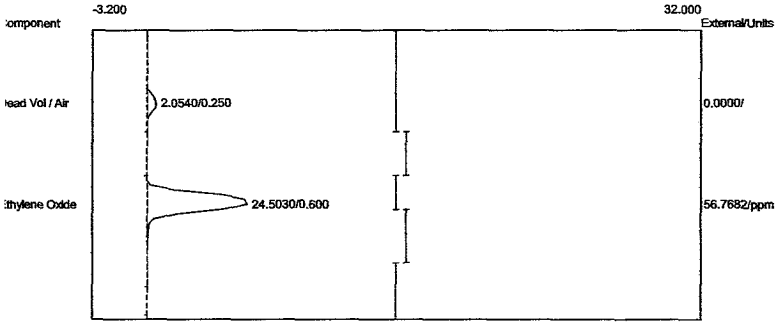
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.0940	0.0000	
Ethylene Oxide	0.583	25.0780	58.1004	ppm
		27.1720	58.1004	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 11:05:45
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-B11.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



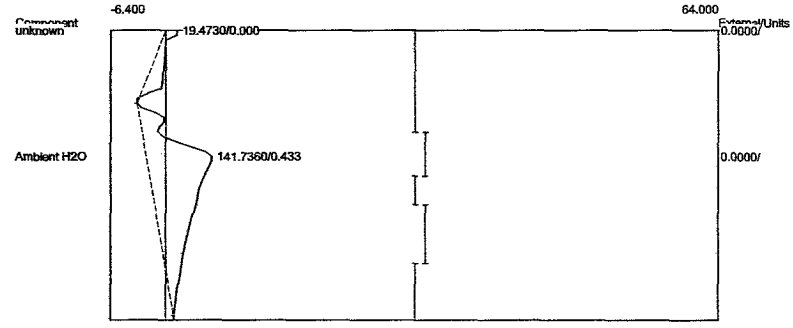
Component	Retention	Area	External	Units
Ambient H2O	0.433	149.9915	0.0000	
		149.9915	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 11:06:51
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-B12.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.0540	0.0000	
Ethylene Oxide	0.600	24.5030	56.7682	ppm
		26.5570	56.7682	

Client: Sterigenics - Ontario
Client ID: Run#1BV
Analysis date: 12/09/2016 11:06:51
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-B12.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer

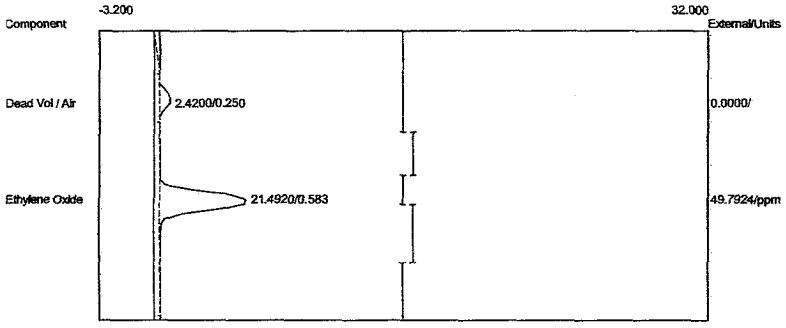


Component	Retention	Area	External	Units
Ambient H2O	0.433	141.7360	0.0000	
		141.7360	0.0000	

APPENDIX C

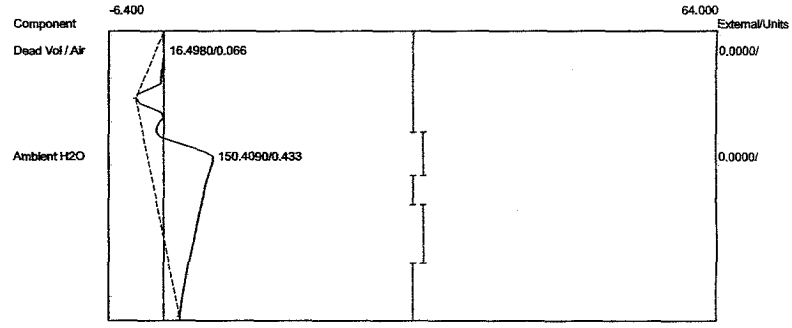
Aeration Chromatograms

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 09:47:06
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-1A01.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



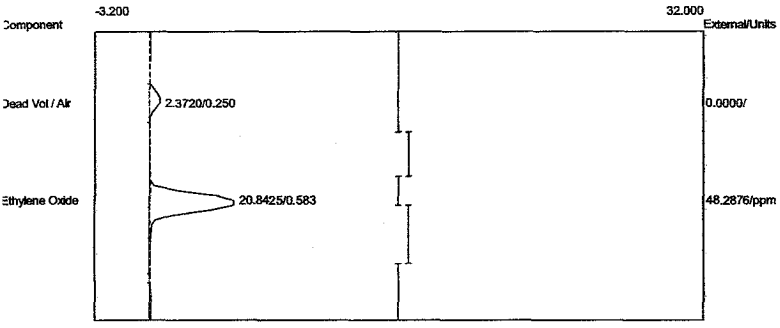
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.4200	0.0000	
Ethylene Oxide	0.583	21.4920	49.7924	ppm
		23.9120	49.7924	

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 09:47:06
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-1A01.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



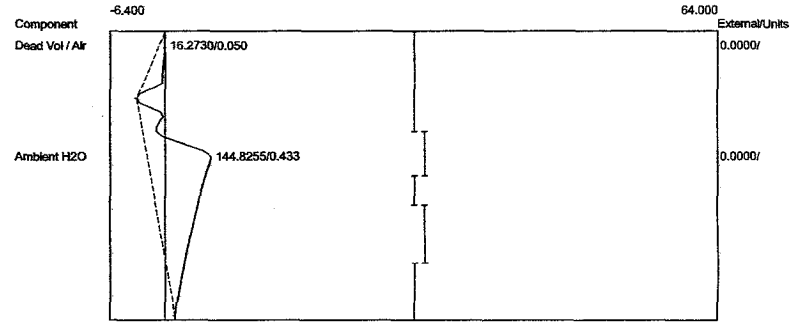
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	16.4980	0.0000	
Ambient H2O	0.433	150.4090	0.0000	
		166.9070	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 09:52:22
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-1A02.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



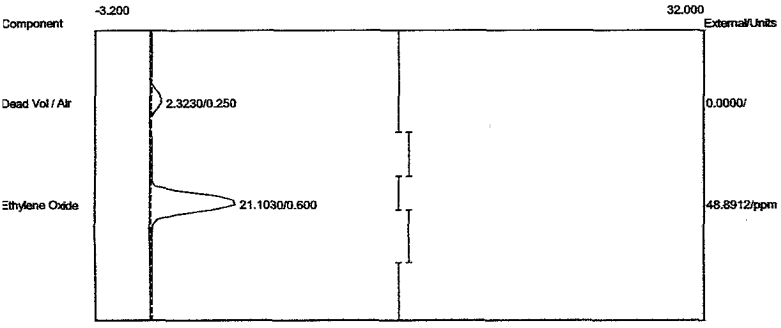
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.3720	0.0000	
Ethylene Oxide	0.583	20.8425	48.2876	ppm
		23.2145	48.2876	

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 09:52:22
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-1A02.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



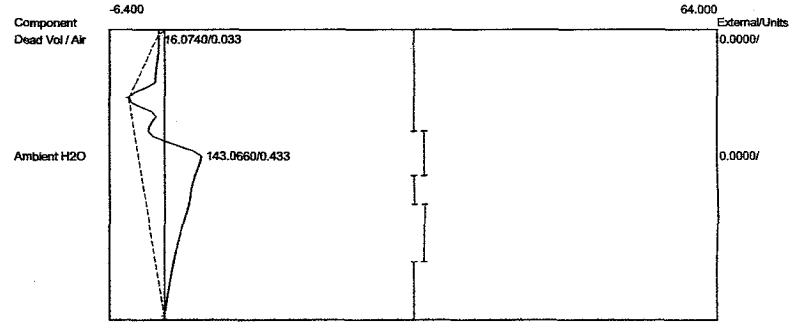
Component	Retention	Area	External	Units
Dead Vol / Air	0.050	16.2730	0.0000	
Ambient H2O	0.433	144.8255	0.0000	
		161.0985	0.0000	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 09:57:50
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-1A03.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



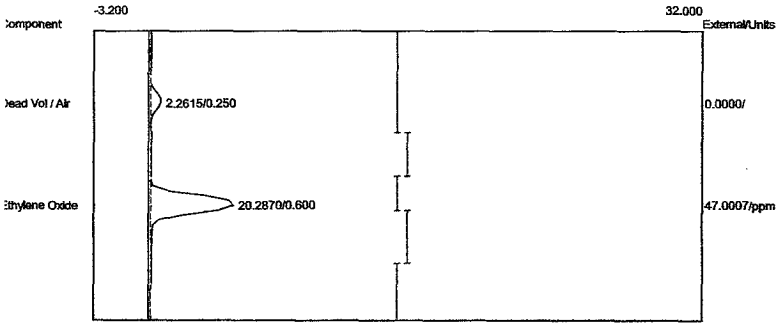
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.3230	0.0000	
Ethylene Oxide	0.600	21.1030	48.8912	ppm
		23.4260	48.8912	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 09:57:50
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-1A03.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



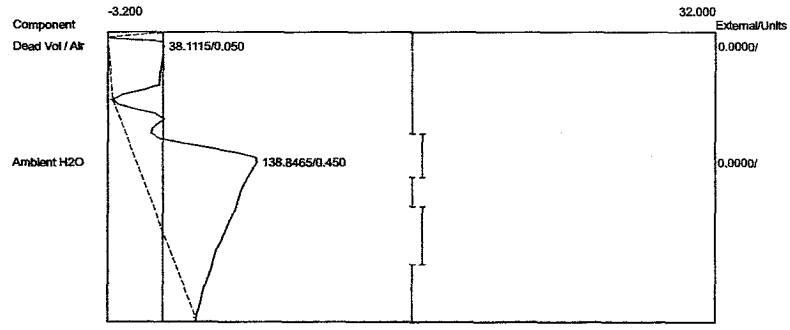
Component	Retention	Area	External	Units
Dead Vol / Air	0.033	16.0740	0.0000	
Ambient H2O	0.433	143.0660	0.0000	
		159.1400	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:02:10
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-1A04.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



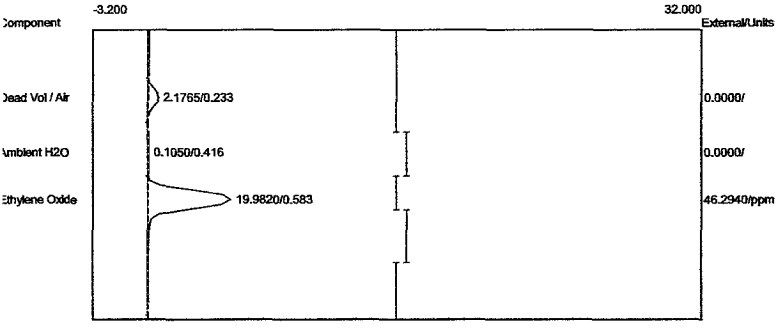
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.2615	0.0000	
Ethylene Oxide	0.600	20.2870	47.0007	ppm
		22.5485	47.0007	

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:02:10
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-1A04.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



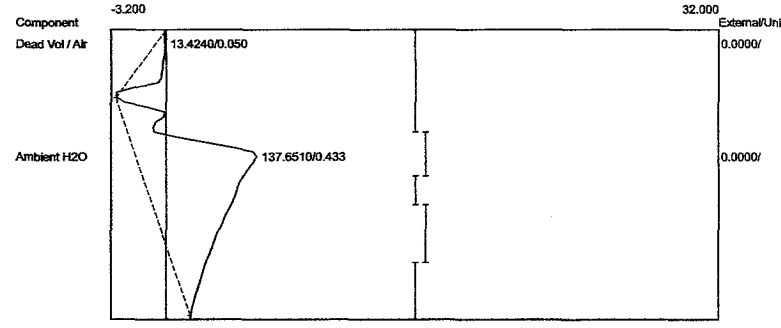
Component	Retention	Area	External	Units
Dead Vol / Air	0.050	38.1115	0.0000	
Ambient H2O	0.450	138.8465	0.0000	
		176.9580	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:07:17
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-1A05.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



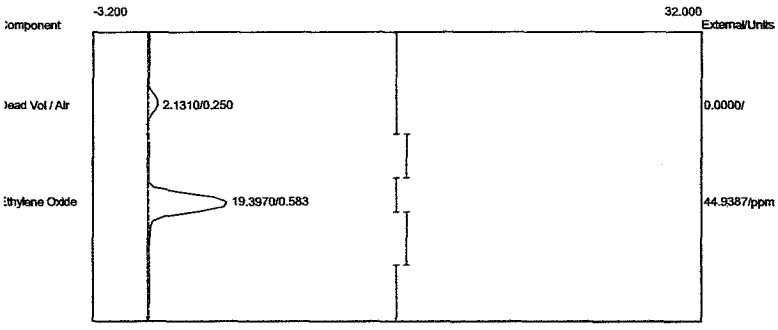
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.1765	0.0000	
Ambient H2O	0.416	0.1050	0.0000	
Ethylene Oxide	0.583	19.9820	46.2940	ppm
		22.2635	46.2940	

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:07:17
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-1A05.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



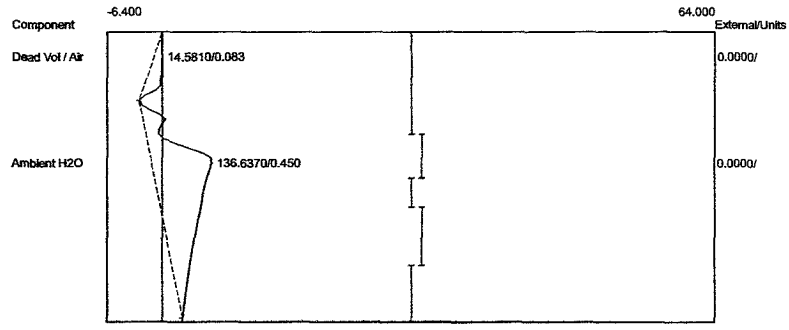
Component	Retention	Area	External	Units
Dead Vol / Air	0.050	13.4240	0.0000	
Ambient H2O	0.433	137.6510	0.0000	
		151.0750	0.0000	

Lab name: ECS
Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:12:20
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-1A06.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.1310	0.0000	
Ethylene Oxide	0.583	19.3970	44.9387	ppm
		21.5280	44.9387	

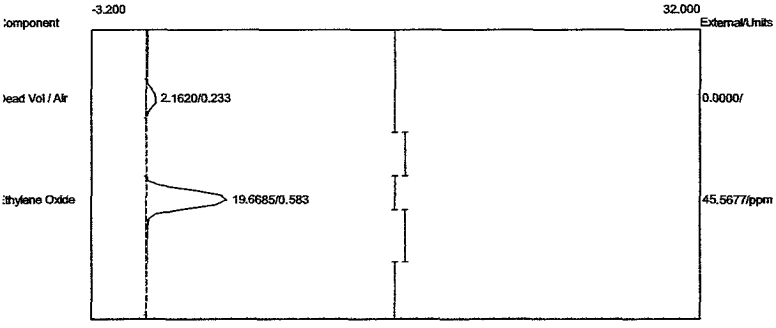
Lab name: ECS
Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:12:20
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-1A06.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.083	14.5810	0.0000	
Ambient H2O	0.450	136.6370	0.0000	
		151.2180	0.0000	

Lab name: ECS

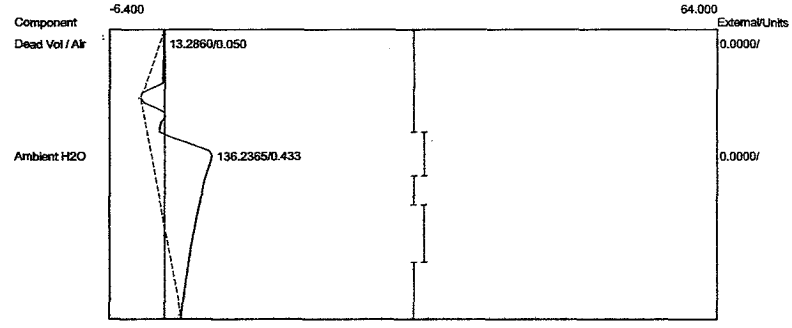
Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:17:26
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-1A07.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.1620	0.0000	
Ethylene Oxide	0.583	19.6685	45.5677	ppm
		21.8305	45.5677	

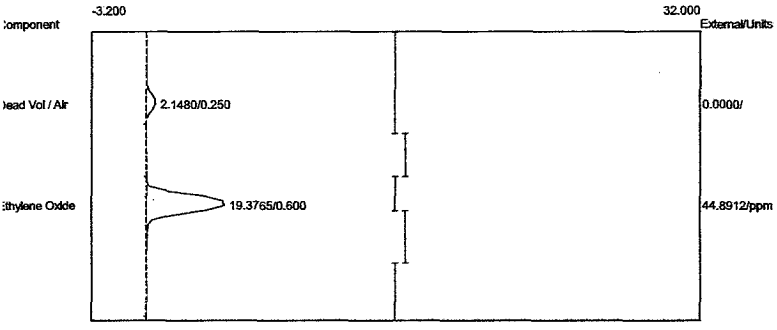
Lab name: ECS

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:17:26
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-1A07.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



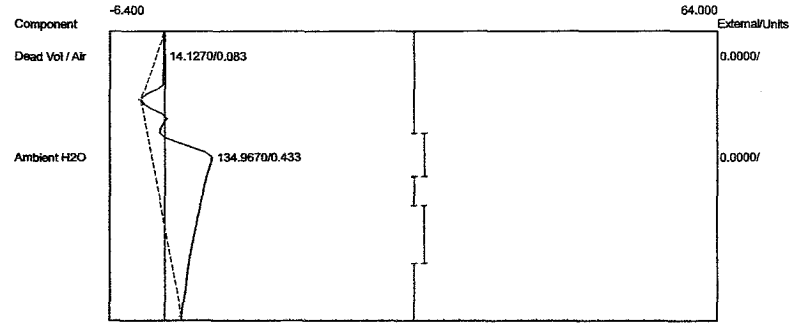
Component	Retention	Area	External	Units
Dead Vol / Air	0.050	13.2860	0.0000	
Ambient H2O	0.433	136.2365	0.0000	
		149.5225	0.0000	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:22:38
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-1A08.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



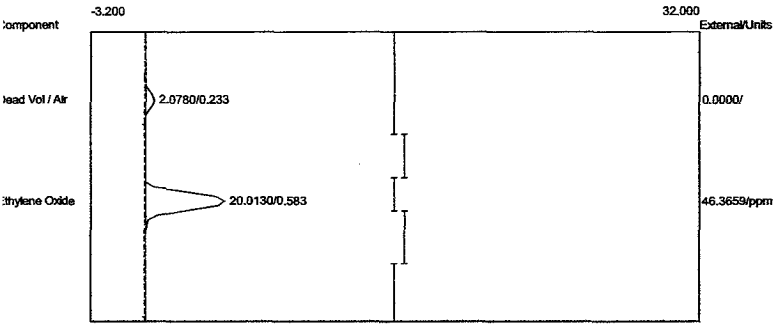
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.1480	0.0000	
Ethylene Oxide	0.600	19.3765	44.8912	ppm
		21.5245	44.8912	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:22:38
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-1A08.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



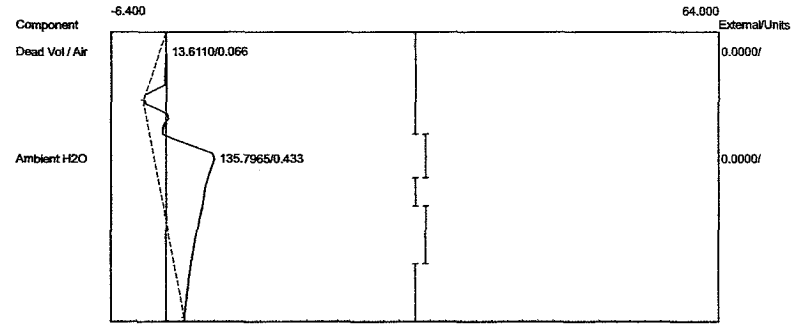
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	14.1270	0.0000	
Ambient H2O	0.433	134.9670	0.0000	
		149.0940	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:27:40
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-1A09.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



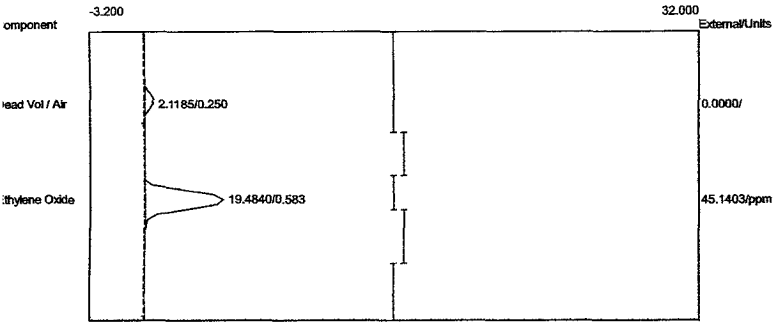
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.0780	0.0000	
Ethylene Oxide	0.583	20.0130	46.3659	ppm
		22.0910	46.3659	

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:27:40
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-1A09.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



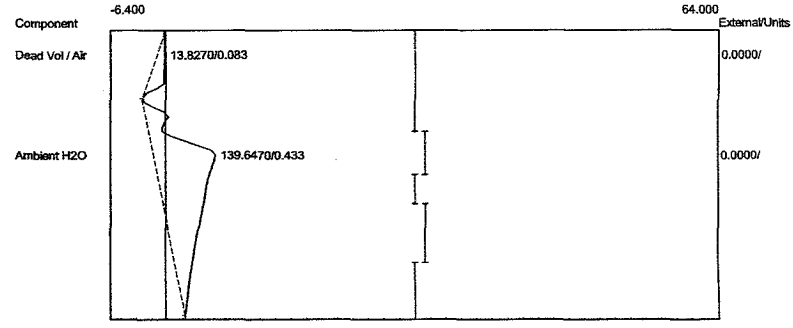
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	13.6110	0.0000	
Ambient H2O	0.433	135.7965	0.0000	
		149.4075	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:32:17
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-1A10.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



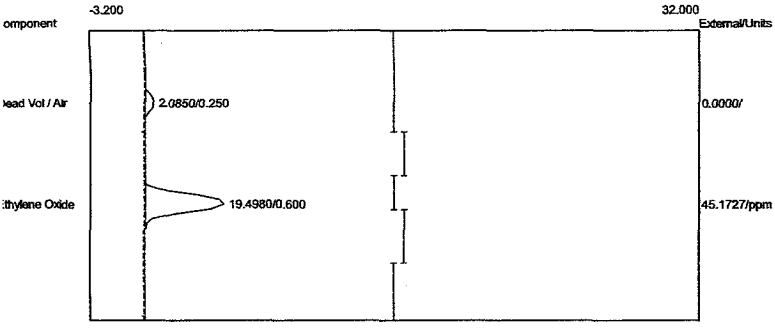
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.1185	0.0000	
Ethylene Oxide	0.583	19.4840	45.1403	ppm
		21.6025	45.1403	

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:32:17
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-1A10.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



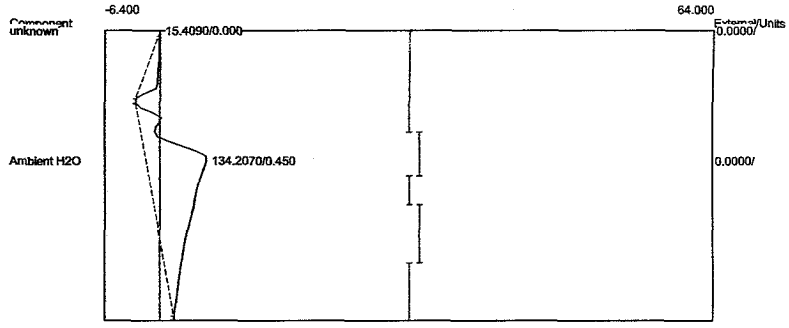
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	13.8270	0.0000	
Ambient H2O	0.433	139.6470	0.0000	
		153.4740	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:37:23
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-1A11.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



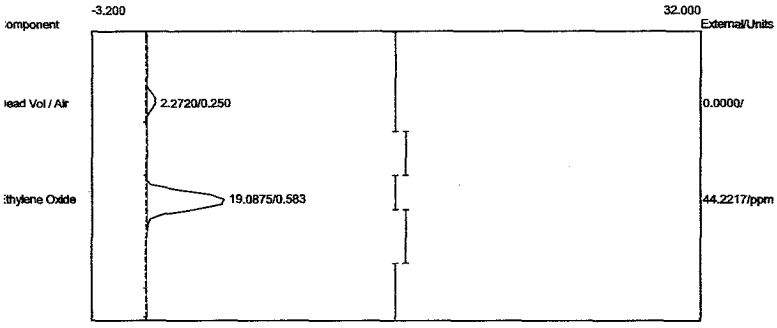
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.0850	0.0000	
Ethylene Oxide	0.600	19.4980	45.1727	ppm
		21.5830	45.1727	

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:37:23
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-1A11.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



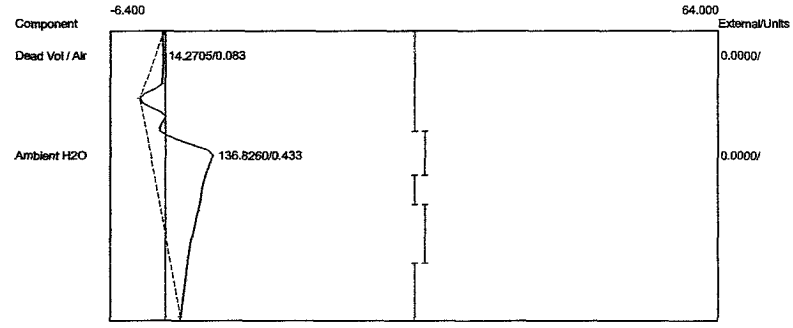
Component	Retention	Area	External	Units
Ambient H2O	0.450	134.2070	0.0000	
		134.2070	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:42:14
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-1A12.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



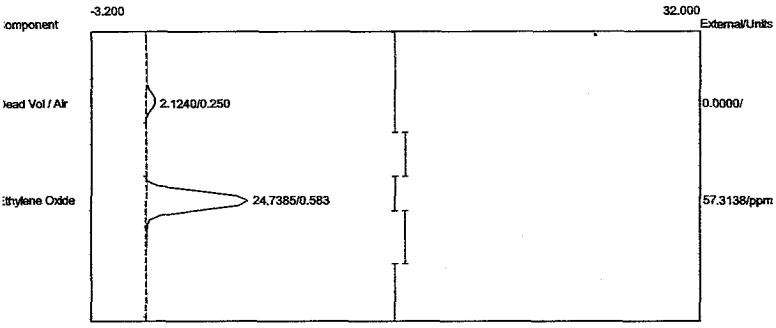
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.2720	0.0000	
Ethylene Oxide	0.583	19.0875	44.2217	ppm
		21.3595	44.2217	

Client: Sterigenics - Ontario
Client ID: Run#1Aer
Analysis date: 12/09/2016 10:42:14
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-1A12.CHR (c:\peak359)
Sample: Ambient Background
Operator: D. Kremer



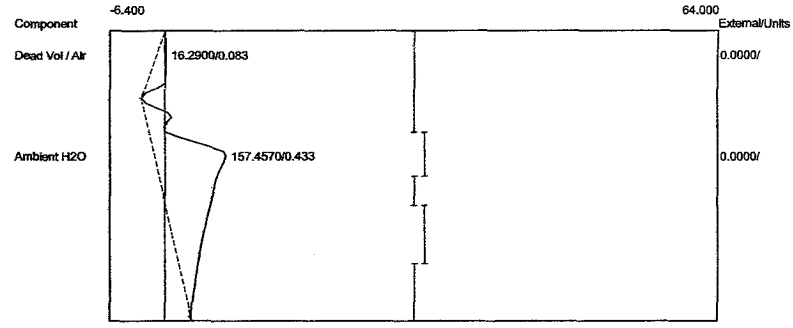
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	14.2705	0.0000	
Ambient H2O	0.433	136.8260	0.0000	
		151.0965	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:10:37
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-2A01.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



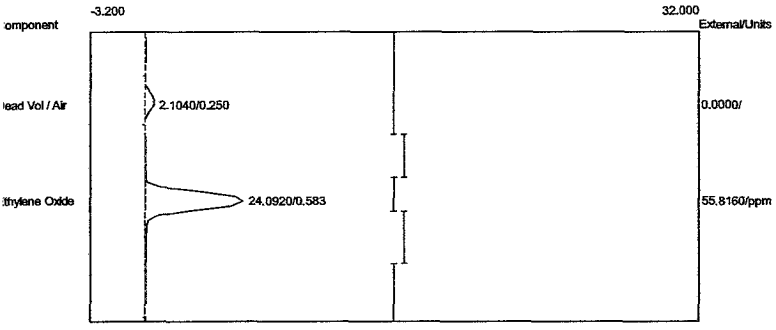
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.1240	0.0000	
Ethylene Oxide	0.583	24.7385	57.3138	ppm
		26.8625	57.3138	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:10:37
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-2A01.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



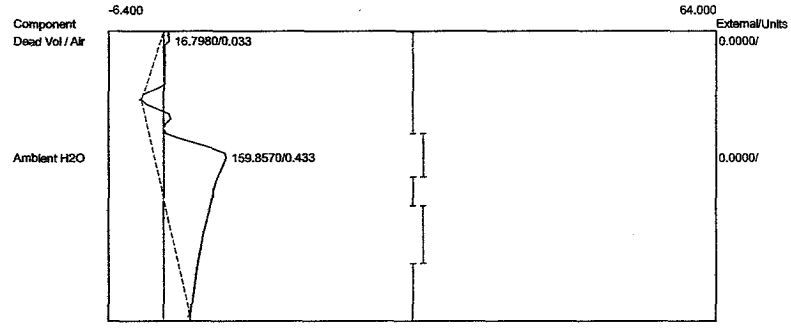
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	16.2900	0.0000	
Ambient H2O	0.433	157.4570	0.0000	
		173.7470	0.0000	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:15:32
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-2A02.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



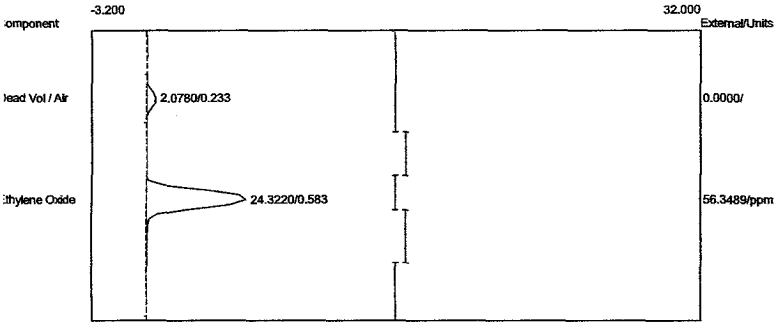
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.1040	0.0000	
Ethylene Oxide	0.583	24.0920	55.8160	ppm
		26.1960	55.8160	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:15:32
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-2A02.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



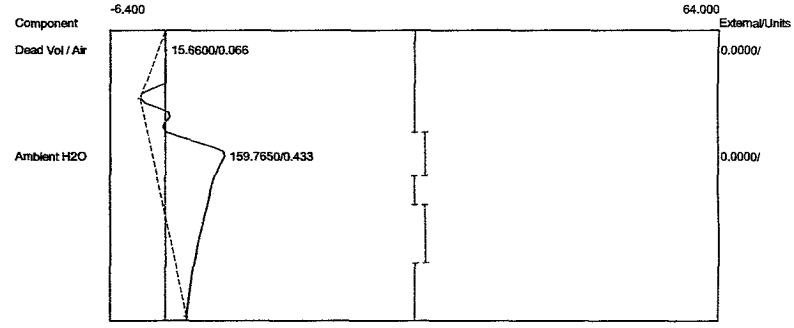
Component	Retention	Area	External	Units
Dead Vol / Air	0.033	16.7980	0.0000	
Ambient H2O	0.433	159.8570	0.0000	
		176.6550	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:20:16
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-2A03.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



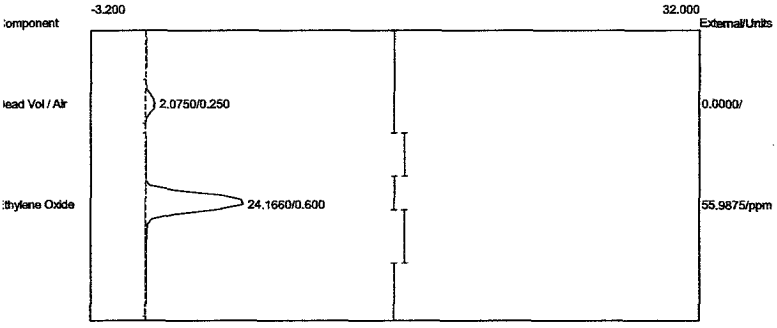
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.0780	0.0000	
Ethylene Oxide	0.583	24.3220	56.3489	ppm
		26.4000	56.3489	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:20:16
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-2A03.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



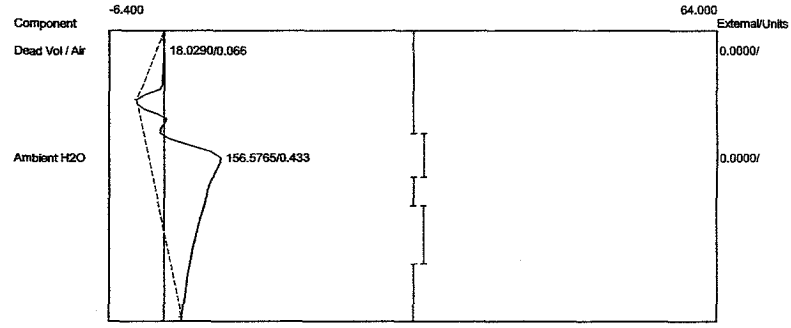
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	15.6600	0.0000	
Ambient H2O	0.433	159.7650	0.0000	
		175.4250	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:25:17
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-2A04.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



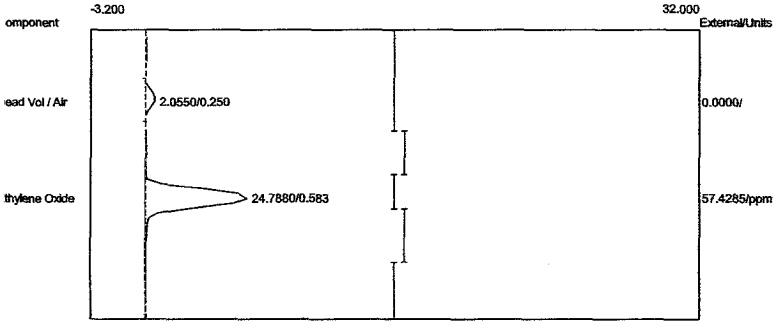
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.0750	0.0000	
Ethylene Oxide	0.600	24.1660	55.9875	ppm
		26.2410	55.9875	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:25:17
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-2A04.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



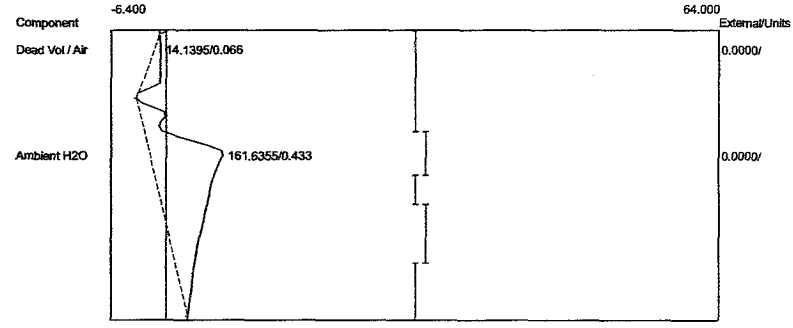
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	18.0290	0.0000	
Ambient H2O	0.433	156.5765	0.0000	
		174.6055	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:30:32
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-2A05.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



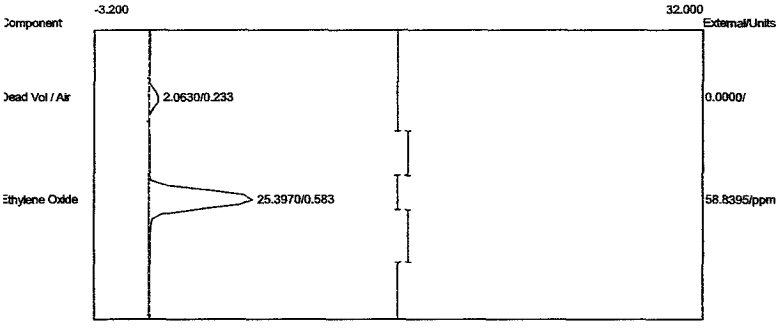
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.0550	0.0000	
Ethylene Oxide	0.583	24.7880	57.4285	ppm
		26.8430	57.4285	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:30:32
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-2A05.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



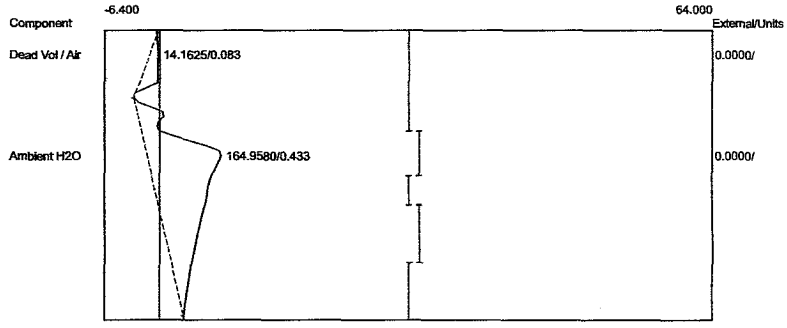
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	14.1395	0.0000	
Ambient H2O	0.433	161.6355	0.0000	
		175.7750	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:35:01
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-2A06.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



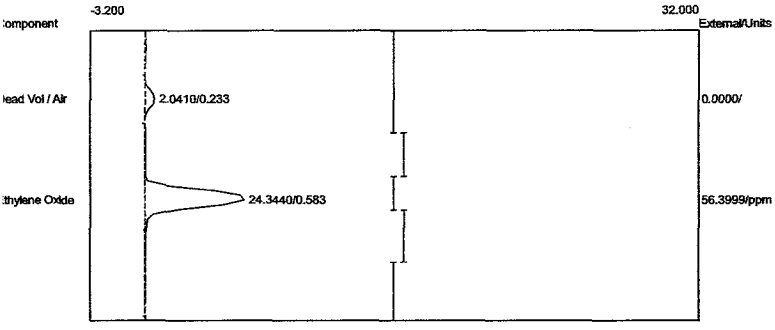
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.0630	0.0000	
Ethylene Oxide	0.583	25.3970	58.8395	ppm
		27.4600	58.8395	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:35:01
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-2A06.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



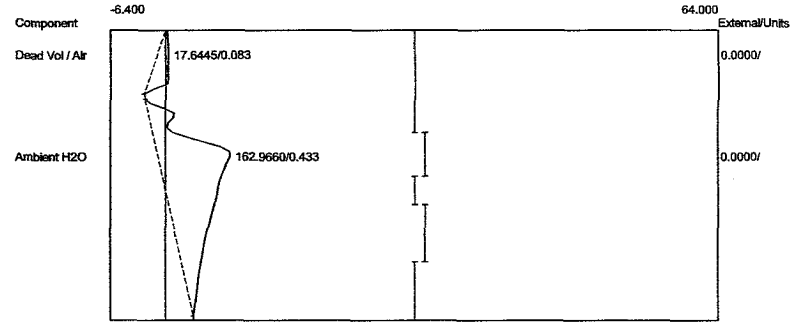
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	14.1625	0.0000	
Ambient H2O	0.433	164.9580	0.0000	
		179.1205	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:40:10
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-2A07.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



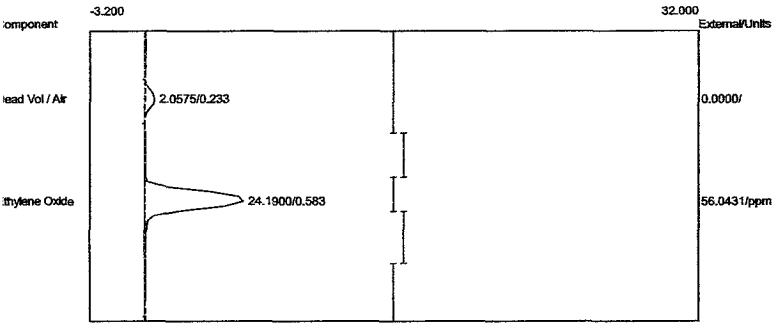
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.0410	0.0000	
Ethylene Oxide	0.583	24.3440	56.3999	ppm
		26.3850	56.3999	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:40:10
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-2A07.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



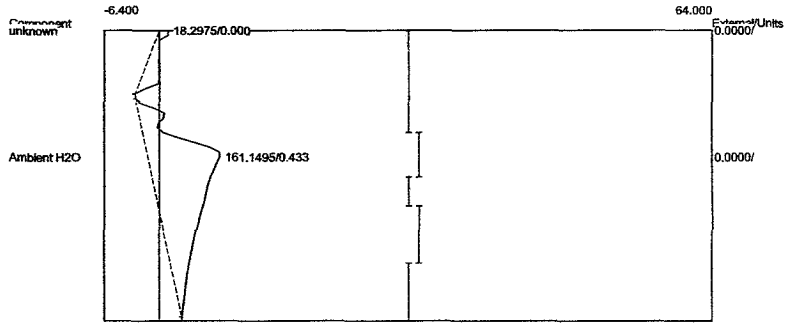
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	17.6445	0.0000	
Ambient H2O	0.433	162.9660	0.0000	
		180.6105	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:45:19
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-2A08.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



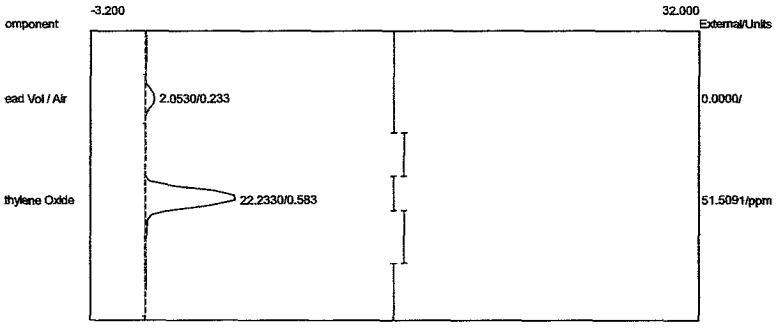
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.0575	0.0000	
Ethylene Oxide	0.583	24.1900	56.0431	ppm
		26.2475	56.0431	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:45:19
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-2A08.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



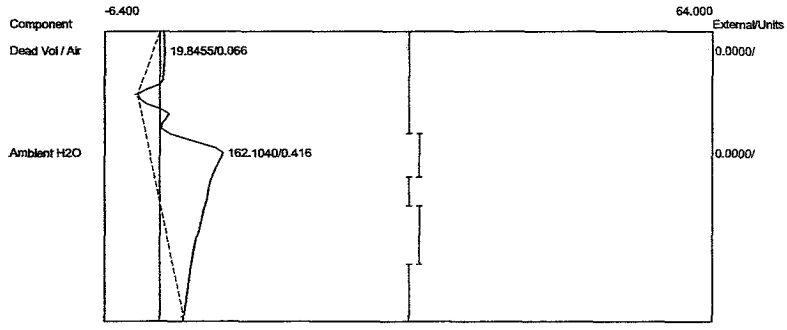
Component	Retention	Area	External	Units
Ambient H2O	0.433	161.1495	0.0000	
		161.1495	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:50:13
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-2A09.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



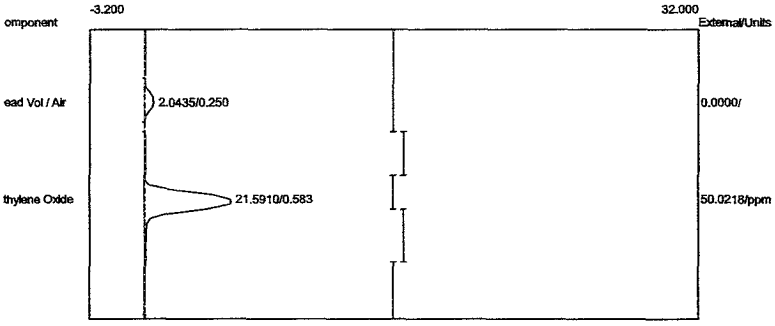
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.0530	0.0000	
Ethylene Oxide	0.583	22.2330	51.5091	ppm
		24.2860	51.5091	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:50:13
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-2A09.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



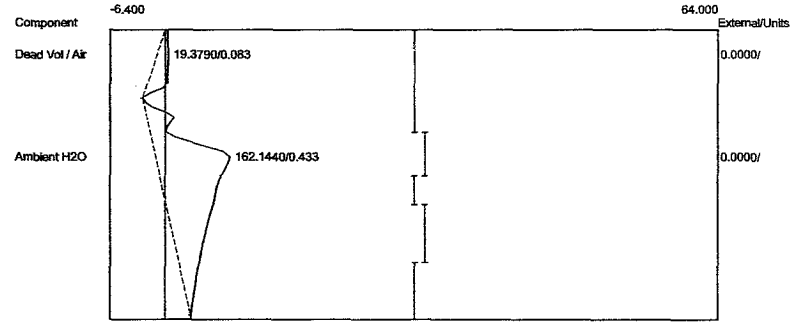
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	19.8455	0.0000	
Ambient H2O	0.416	162.1040	0.0000	
		181.9495	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:55:29
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-2A10.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



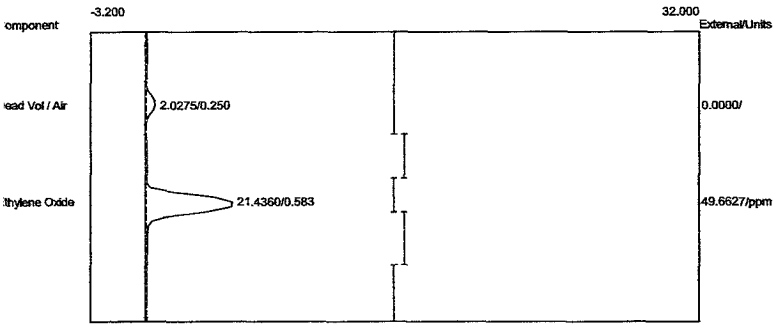
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.0435	0.0000	
Ethylene Oxide	0.583	21.5910	50.0218	ppm
		23.6345	50.0218	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 11:55:29
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-2A10.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



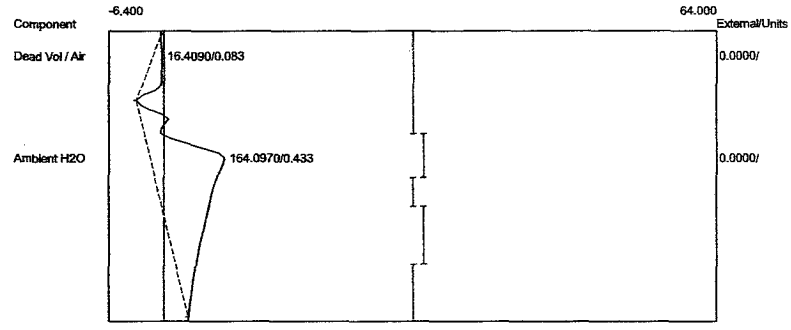
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	19.3790	0.0000	
Ambient H2O	0.433	162.1440	0.0000	
		181.5230	0.0000	

Lab name: EOSI
Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 12:00:30
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-2A11.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



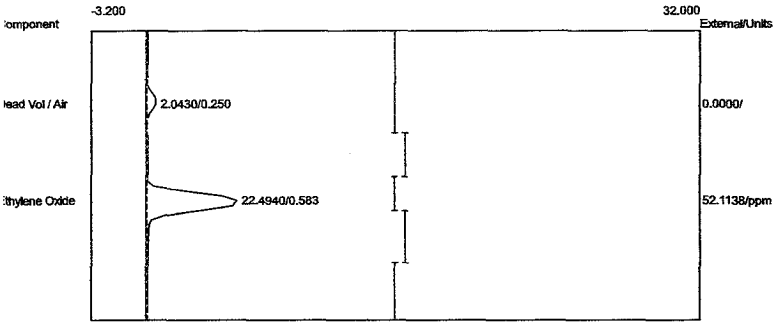
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.0275	0.0000	
Ethylene Oxide	0.583	21.4360	49.6627	ppm
		23.4635	49.6627	

Lab name: EOSI
Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 12:00:30
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-2A11.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



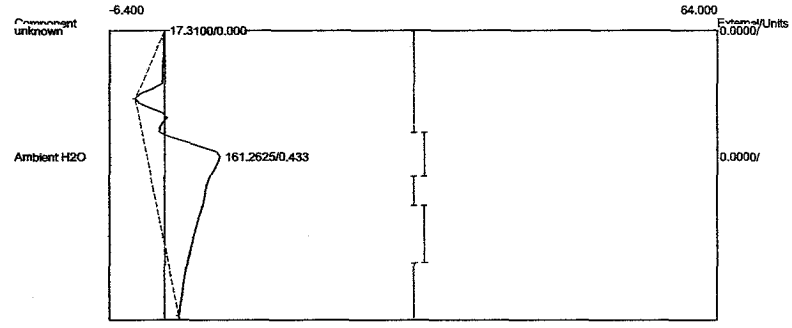
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	16.4090	0.0000	
Ambient H2O	0.433	164.0970	0.0000	
		180.5060	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 12:05:18
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-2A12.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



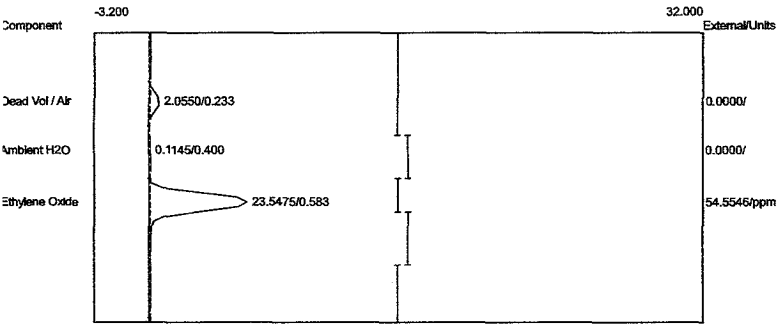
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.0430	0.0000	
Ethylene Oxide	0.583	22.4940	52.1138	ppm
		24.5370	52.1138	

Client: Sterigenics - Ontario
Client ID: Run#2Aer
Analysis date: 12/09/2016 12:05:18
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-2A12.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



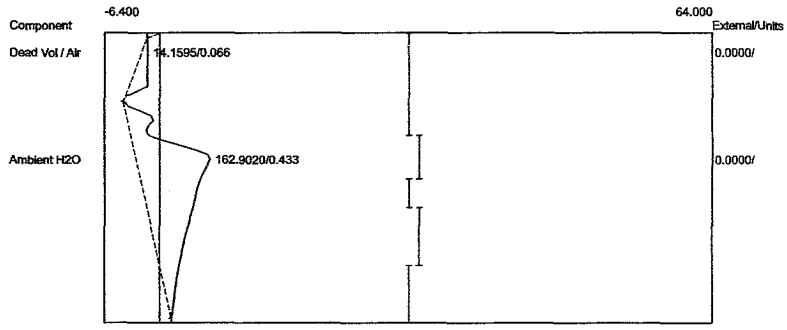
Component	Retention	Area	External	Units
Ambient H2O	0.433	161.2625	0.0000	
		161.2625	0.0000	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:10:32
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-3A01.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



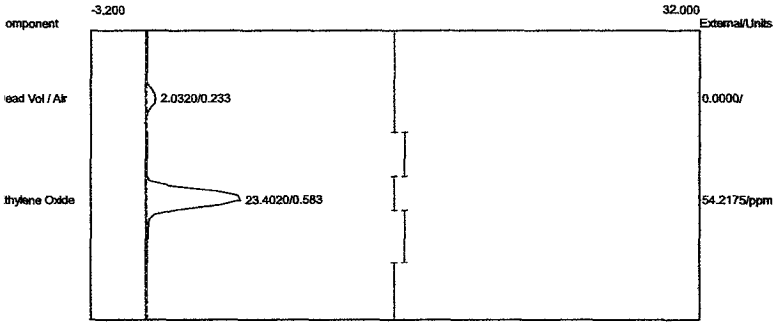
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.0550	0.0000	
Ambient H2O	0.400	0.1145	0.0000	
Ethylene Oxide	0.583	23.5475	54.5546	ppm
		25.7170	54.5546	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:10:32
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-3A01.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



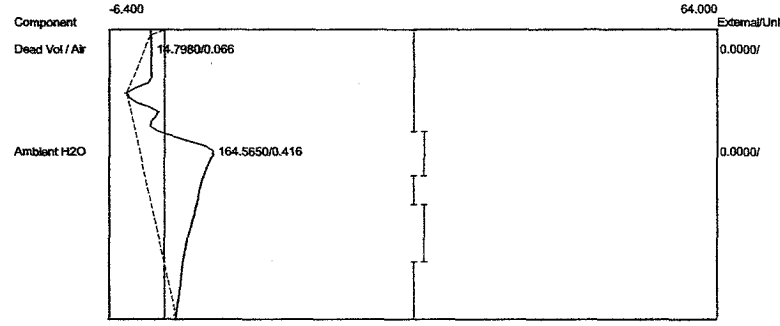
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	14.1595	0.0000	
Ambient H2O	0.433	162.9020	0.0000	
		177.0615	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:15:37
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-3A02.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



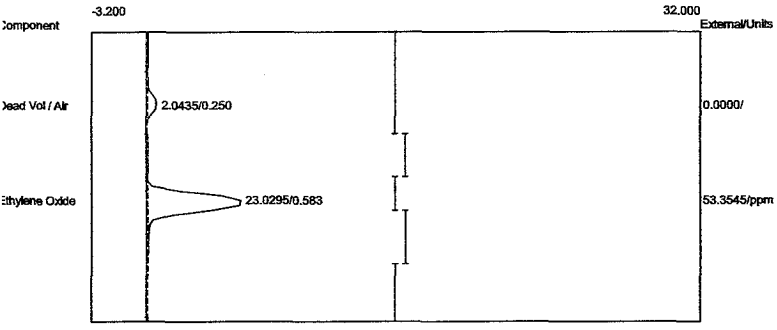
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.0320	0.0000	
Ethylene Oxide	0.583	23.4020	54.2175	ppm
		25.4340	54.2175	

Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:15:37
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-3A02.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



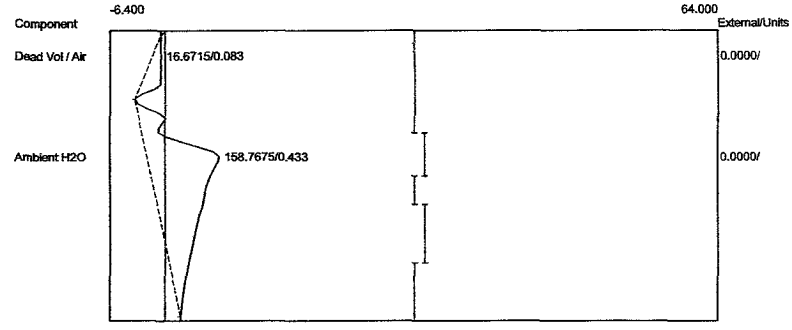
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	14.7980	0.0000	
Ambient H2O	0.416	164.5650	0.0000	
		179.3630	0.0000	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:20:26
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-3A03.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



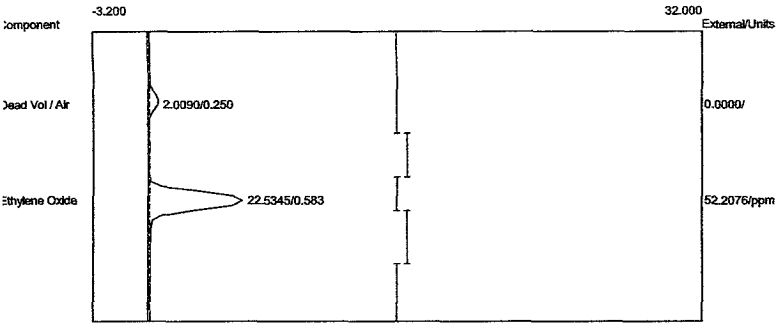
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.0435	0.0000	
Ethylene Oxide	0.583	23.0295	53.3545	ppm
		25.0730	53.3545	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:20:26
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-3A03.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



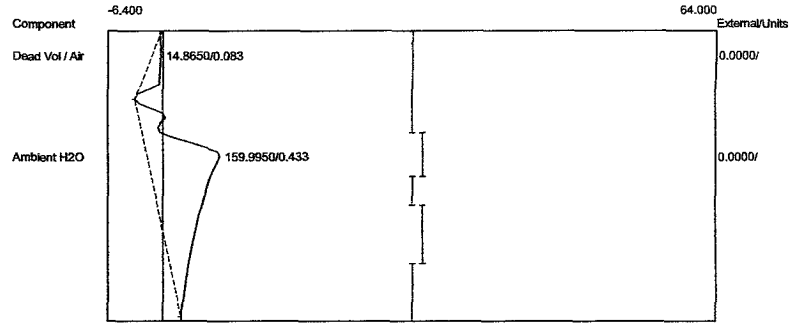
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	16.6715	0.0000	
Ambient H2O	0.433	158.7675	0.0000	
		175.4390	0.0000	

Lab name: EOS
Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:25:26
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-3A04.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



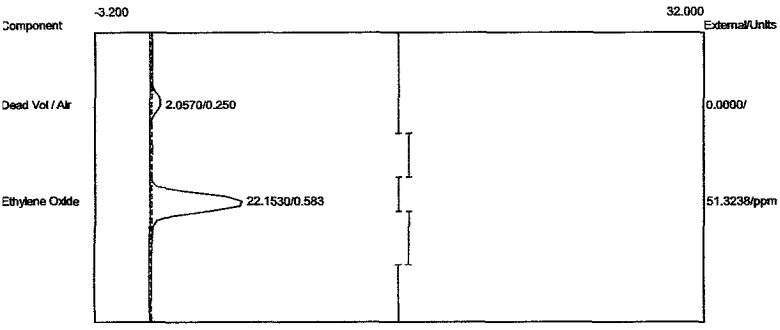
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.0090	0.0000	
Ethylene Oxide	0.583	22.5345	52.2076	ppm
		24.5435	52.2076	

Lab name: EOS
Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:25:26
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-3A04.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



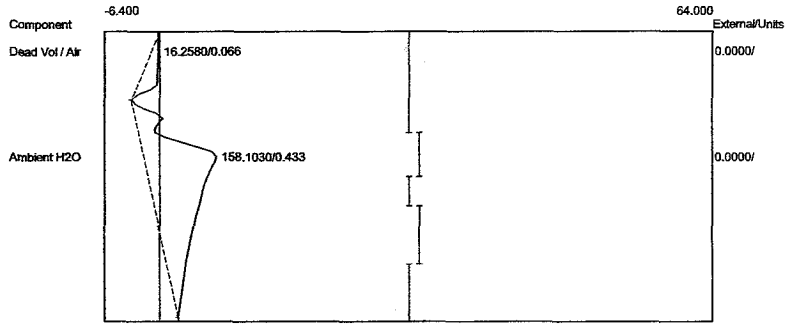
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	14.8650	0.0000	
Ambient H2O	0.433	159.9950	0.0000	
		174.8600	0.0000	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:30:29
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-3A05.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



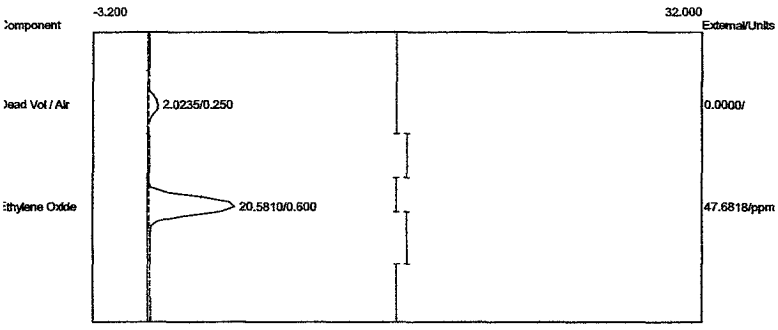
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.0570	0.0000	
Ethylene Oxide	0.583	22.1530	51.3238	ppm
		24.2100	51.3238	

Lab name: ECSI
Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:30:29
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-3A05.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



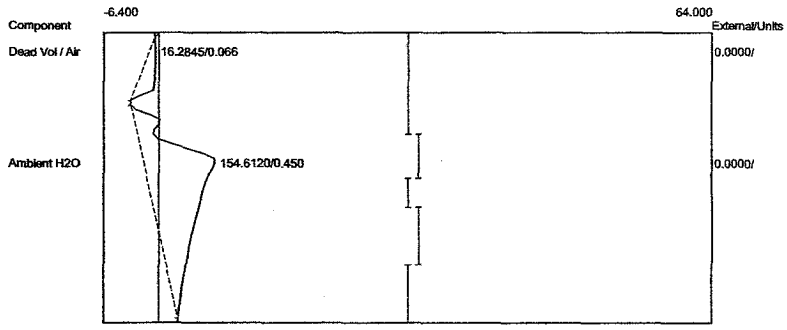
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	16.2580	0.0000	
Ambient H2O	0.433	158.1030	0.0000	
		174.3610	0.0000	

Lab name: ESC
Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:35:03
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-3A06.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



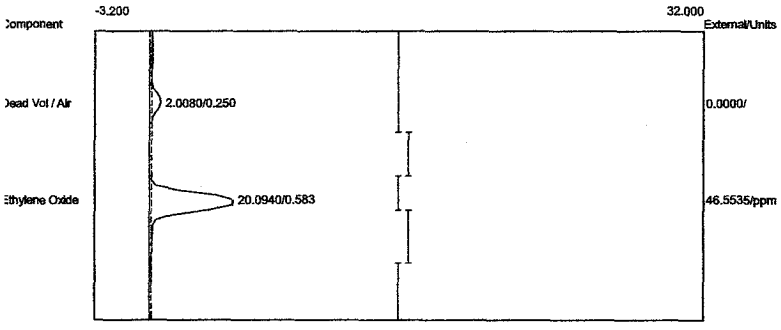
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.0235	0.0000	
Ethylene Oxide	0.600	20.5810	47.6818	ppm
		22.6045	47.6818	

Lab name: ESC
Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:35:03
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-3A06.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



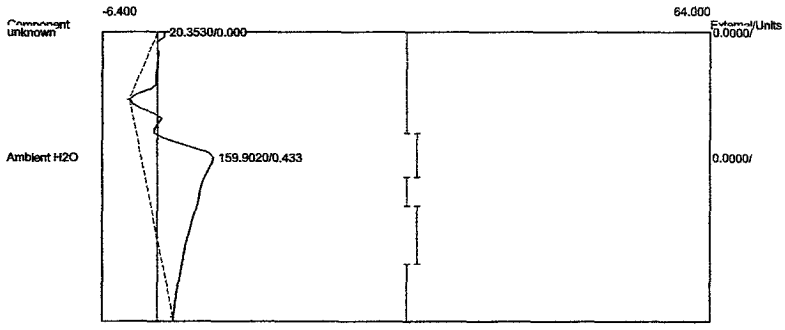
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	16.2845	0.0000	
Ambient H2O	0.450	154.6120	0.0000	
		170.8965	0.0000	

Lab name: ECS
Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:40:28
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-3A07.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



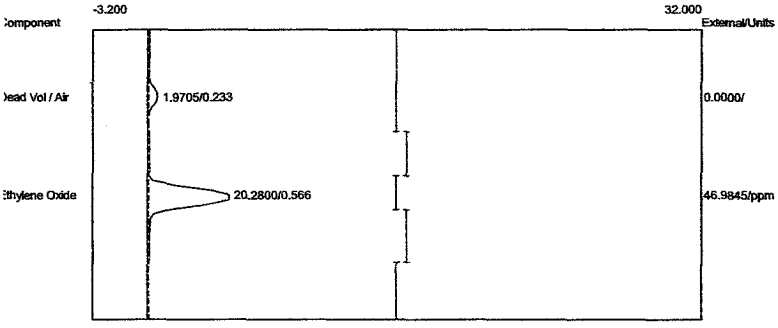
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.0080	0.0000	
Ethylene Oxide	0.583	20.0940	46.5535	ppm
		22.1020	46.5535	

Lab name: ECS
Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:40:28
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-3A07.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



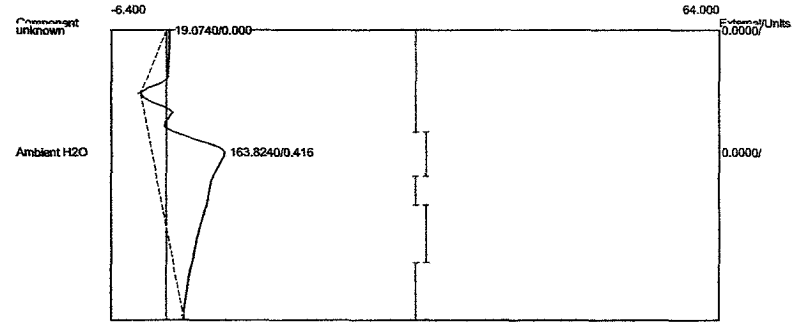
Component	Retention	Area	External	Units
Ambient H2O	0.433	159.9020	0.0000	
		159.9020	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:45:14
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-3A08.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



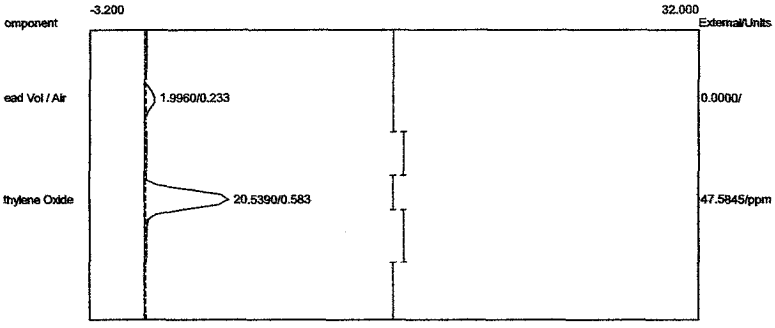
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	1.9705	0.0000	
Ethylene Oxide	0.566	20.2800	46.9845	ppm
		22.2505	46.9845	

Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:45:14
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-3A08.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



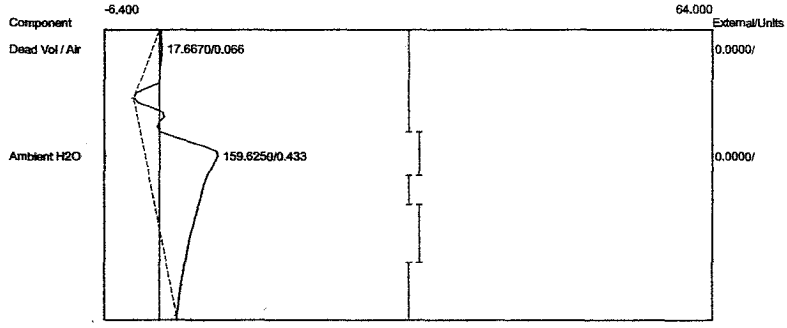
Component	Retention	Area	External	Units
Ambient H2O	0.416	163.8240	0.0000	
		163.8240	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:50:14
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-3A09.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



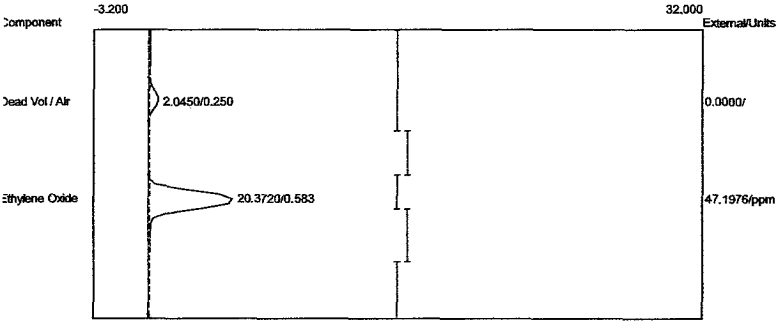
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	1.9960	0.0000	
Ethylene Oxide	0.583	20.5390	47.5845	ppm
		22.5350	47.5845	

Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:50:14
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-3A09.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



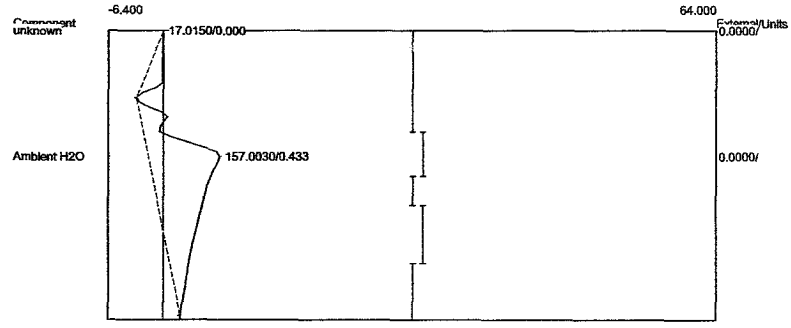
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	17.6670	0.0000	
Ambient H2O	0.433	159.6250	0.0000	
		177.2920	0.0000	

Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:55:03
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-3A10.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.250	2.0450	0.0000	
Ethylene Oxide	0.583	20.3720	47.1976	ppm
		22.4170	47.1976	

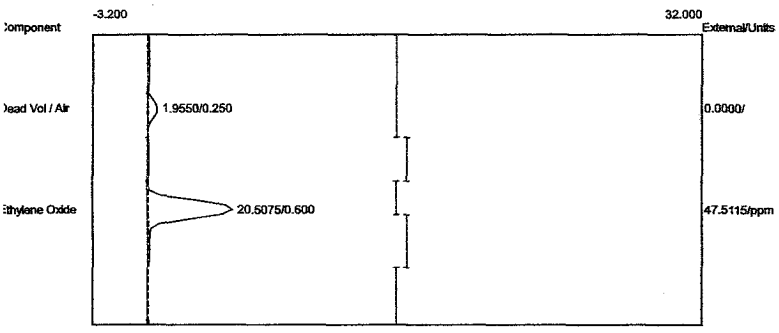
Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 12:55:03
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-3A10.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Ambient H2O	0.433	157.0030	0.0000	
		157.0030	0.0000	

Lab name: ECS

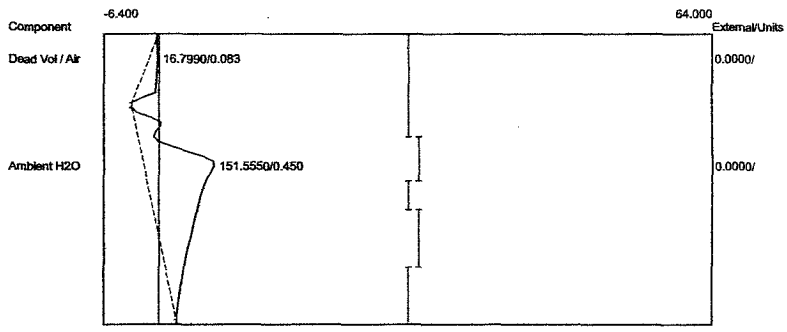
Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 13:00:06
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterOnt2016-3A11.CHR (c:\peak359)
Sample: Abator Inlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.250	1.9550	0.0000	
Ethylene Oxide	0.600	20.5075	47.5115	ppm
		22.4625	47.5115	

Lab name: ECS

Client: Sterigenics - Ontario
Client ID: Run#3Aer
Analysis date: 12/09/2016 13:00:06
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2SterOnt2016-3A11.CHR (c:\peak359)
Sample: Abator Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.083	16.7990	0.0000	
Ambient H2O	0.450	151.5550	0.0000	
		168.3540	0.0000	

APPENDIX D

Field Data and Calculation Worksheets

ECSi, Inc.

Ethylene Oxide Mass Emissions Data and Calculations

Sterigenics, Inc. - Ontario, California
12-9-16 - Backvent Test Data

DeltaP	SqRtDeltaP	Stack Temp (F)	ppm EtO	Catalyst Temp			
					mw =	28.51	
					stack area =	15.9	
0.14	0.3742	210	0.01	299	**press =**	29.10	
0.14	0.3742	210	0.01	299	**Tstd =**	528	
0.14	0.3742	210	0.01	299	**Pstd =**	29.92	
0.14	0.3742	211	0.01	299	**Cp =**	0.99	
0.14	0.3742	211	0.01	299	**Kp =**	85.49	
0.14	0.3742	211	0.01	298			
0.14	0.3742	211	0.01	299	**Velocity =**	28.5	ft/sec
0.14	0.3742	211	0.01	299	**Flow =**	**20173**	**dscfm**
0.14	0.3742	211	0.01	299			
0.14	0.3742	211	0.01	299	**MWeto =**	44.05	
0.14	0.3742	211	0.01	299	**MolVol =**	385.32	
0.14	0.3742	211	0.01	300	**ppmv/ft3 =**	1000000	
Average =					**EtO Mass Flow =**	**0.0000231**	**lbs/min**
0.14	0.3742	210.8	0.0100	299.0	**EtO Mass Flow =**	**0.001384**	**lbs/hr**

= 671 degR

ECSi, Inc.

Ethylene Oxide Mass Emissions Data and Calculations

Sterigenics, Inc. - Ontario, California
12-9-16 - Aeration Test Data

DeltaP	SqRtDeltaP	Stack Temp (F)	ppm EtO	Catalyst Temp
Run#1				
0.14	0.3742	211	0.01	299
0.14	0.3742	210	0.01	299
0.14	0.3742	211	0.01	298
0.14	0.3742	211	0.01	298
0.14	0.3742	210	0.01	298
0.14	0.3742	210	0.01	298
0.14	0.3742	210	0.01	298
0.14	0.3742	210	0.01	299
0.14	0.3742	210	0.01	299
0.14	0.3742	210	0.01	299
0.14	0.3742	210	0.01	299
0.14	0.3742	210	0.01	298
Run#2				
0.14	0.3742	211	0.01	300
0.14	0.3742	211	0.01	300
0.14	0.3742	211	0.01	299
0.14	0.3742	211	0.01	299
0.14	0.3742	211	0.01	299
0.14	0.3742	212	0.01	299
0.14	0.3742	212	0.01	300
0.14	0.3742	212	0.01	299
0.14	0.3742	212	0.01	300
0.14	0.3742	212	0.01	299
0.14	0.3742	212	0.01	299
0.14	0.3742	212	0.01	299
Run#3				
0.14	0.3742	213	0.01	299
0.14	0.3742	213	0.01	299
0.14	0.3742	213	0.01	300
0.14	0.3742	213	0.01	300
0.14	0.3742	213	0.01	299
0.14	0.3742	212	0.01	299
0.14	0.3742	212	0.01	299
0.14	0.3742	212	0.01	300
0.14	0.3742	212	0.01	299
0.14	0.3742	212	0.01	299
0.14	0.3742	212	0.01	299
0.14	0.3742	212	0.01	300
Average =				
0.14	0.3742	211.4	0.0100	299.1
		= 671	degR	

mw =	28.51	
stack area =	15.9	
press =	29.10	
Tstd =	528	
Pstd =	29.92	
Cp =	0.99	
Kp =	85.49	
Velocity =	28.5	ft/sec
Flow =	**20163**	**dscfm**
MWeto =	44.05	
MolVol =	385.32	
ppmv/ft3 =	1000000	
EtO Mass Flow =	**0.0000231**	**lbs/min**
EtO Mass Flow =	**0.001383**	**lbs/hr**

APPENDIX E

Gas Certifications

CERTIFIED WORKING CLASS

Single-Certified Calibration Standard

Scott Specialty Gases

600 CAJON BLVD., SAN BERNARDINO, CA 92411 Phone: 909-887-2571 Fax: 909-887-0549

CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

Product Information
Project No.: 02-57164-001
Item No.: 0202000131OTCL
P.O. No.: VBL – D. KREMER

Cylinder Number: CAL4448
Cylinder Size: CL
Certification Date: 18Apr2016

Customer

ECSI, INC
PO BOX 848
SAN CLEMENTE, CA 92672

CERTIFIED CONCENTRATION

Component Name	Concentration (Moles)		Accuracy (+/-%)
ETHYLENE OXIDE	1.10	PPM	5
NITROGEN		BALANCE	

TRACEABILITY

Traceable To

Scott Reference Standard

APPROVED BY: MT DATE: 4-18-16

SPECIFICATIONS

Component Name	Requested Concentration (Moles)	Certified Concentration (Moles)	Blend Tolerance Result (+/- %)	Certified Accuracy Result (+/- %)
ETHYLENE OXIDE	1. PPM	1.10 PPM	10.0	5.00
NITROGEN	BAL	BAL		

TRACEABILITY

Traceable To
Scott Reference Standard

PHYSICAL PROPERTIES

Cylinder Size: CL

Pressure: 1300 PSIG
Expiration Date: 18Apr2018

SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.

COMMENTS

CERTIFIED WORKING CLASS

Single-Certified Calibration Standard

Scott Specialty Gases

00 CAJON BLVD., SAN BERNARDINO, CA 92411 Phone: 909-887-2571 Fax: 909-887-0549

CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

Product Information
Project No.: 02-57164-003
Item No.: 02020001320TCL
P.O. No.: VBL – D. KREMER

Cylinder Number: CLM003232
Cylinder Size: CL
Certification Date: 18Apr2016

Customer

ECSI, INC
PO BOX 848
SAN CLEMENTE, CA 92672

CERTIFIED CONCENTRATION

Component Name	Concentration (Moles)		Accuracy (+/-%)
ETHYLENE OXIDE	10.1	PPM	5
NITROGEN		BALANCE	

TRACEABILITY

Traceable To

Scott Reference Standard

APPROVED BY: MT MT DATE: 4-18-16

SPECIFICATIONS

Component Name	Requested Concentration (Moles)	Certified Concentration (Moles)	Blend Tolerance Result (+/- %)	Certified Accuracy Result (+/- %)
ETHYLENE OXIDE	10. PPM	10.1 PPM	1.0	5.00
NITROGEN	BAL	BAL		

TRACEABILITY

Traceable To
Scott Reference Standard

PHYSICAL PROPERTIES

Cylinder Size: CL

Pressure: 1400 PSIG
Expiration Date: 18Apr2018

SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.

COMMENTS

CERTIFIED WORKING CLASS

Single-Certified Calibration Standard

Scott Specialty Gases
500 CAJON BLVD., SAN BERNARDINO, CA 92411 Phone: 909-887-2571 Fax: 909-887-0549

CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

Product Information
Project No.: 02-57164-004
Item No.: 02020001330TCL
P.O. No.: VBL – D. KREMER

Cylinder Number: CLM011385
Cylinder Size: CL
Certification Date: 18Apr2016

Customer

ECSI, INC
PO BOX 848
SAN CLEMENTE, CA 92672

CERTIFIED CONCENTRATION

Component Name	Concentration (Moles)		Accuracy (+/-%)
ETHYLENE OXIDE	100.	PPM	5
NITROGEN		BALANCE	

TRACEABILITY

Traceable To

Scott Reference Standard

APPROVED BY: B. McCully BLM DATE: 4-18-16

SPECIFICATIONS

Component Name	Requested Concentration (Moles)		Certified Concentration (Moles)		Blend Tolerance Result (+/- %)	Certified Accuracy Result (+/- %)
ETHYLENE OXIDE	100.	PPM	100.	PPM	.0	5.00
NITROGEN		BAL		BAL		

TRACEABILITY

Traceable To
Scott Reference Standard

PHYSICAL PROPERTIES

Cylinder Size: CL

Pressure: 1400 PSIG
Expiration Date: 18Apr2018

Valve Connection: CGA 350

SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.

COMMENTS

CERTIFIED WORKING CLASS

Single-Certified Calibration Standard

Scott Specialty Gases

500 CAJON BLVD., SAN BERNARDINO, CA 92411 Phone: 909-887-2571 Fax: 909-887-0549

CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

Product Information
Project No.: 02-57164-005
Item No.: 020200013 40TCL
P.O. No.: VBL – D. KREMER

Cylinder Number: CLM002810
Cylinder Size: CL
Certification Date: 18Apr2016

Customer

ECSI, INC
PO BOX 848
SAN CLEMENTE, CA 92672

CERTIFIED CONCENTRATION

Component Name	Concentration (Moles)		Accuracy (+/-%)
ETHYLENE OXIDE	1,000.	PPM	5
NITROGEN		BALANCE	

TRACEABILITY

Traceable To

Scott Reference Standard

APPROVED BY: B. McCall BLM DATE: 4-18-16

SPECIFICATIONS

Component Name	Requested Concentration (Moles)		Certified Concentration (Moles)		Blend Tolerance Result (+/- %)	Certified Accuracy Result (+/- %)
ETHYLENE OXIDE	1,000.	PPM	1,000.	PPM	.0	5.00
NITROGEN		BAL		BAL		

TRACEABILITY

Traceable To
Scott Reference Standard

PHYSICAL PROPERTIES

Cylinder Size: CL

Pressure: 1300 PSIG
Expiration Date: 18Apr2018

Valve Connection: CGA 350

SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.

COMMENTS

CERTIFIED WORKING CLASS

Single-Certified Calibration Standard

Scott Specialty Gases

00 CAJON BLVD., SAN BERNARDINO, CA 92411 Phone: 909-887-2571 Fax: 909-887-0549

CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

Product Information
Project No.: 02-57164-006
Item No.: 02020001340TCL
P.O. No.: VBL – D. KREMER

Cylinder Number: CLM005787
Cylinder Size: CL
Certification Date: 18Apr2016

Customer

ECSI, INC
PO BOX 848
SAN CLEMENTE, CA 92672

CERTIFIED CONCENTRATION

Component Name	Concentration (Moles)		Accuracy (+/-%)
ETHYLENE OXIDE	10,080.	PPM	5
NITROGEN		BALANCE	

TRACEABILITY

Traceable To

Scott Reference Standard

APPROVED BY: B. McCully BLM DATE: 4-18-16

SPECIFICATIONS

Component Name	Requested Concentration (Moles)		Certified Concentration (Moles)		Blend Tolerance Result (+/- %)	Certified Accuracy Result (+/- %)
ETHYLENE OXIDE	10,000.	PPM	10,080.	PPM	.8	5.00
NITROGEN		BAL		BAL		

TRACEABILITY

Traceable To
Scott Reference Standard

PHYSICAL PROPERTIES

Cylinder Size: CL

Pressure: 800 PSIG
Expiration Date: 18Apr2018

Valve Connection: CGA 350

SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.

COMMENTS

CERTIFICATE OF ANALYSIS

Customer Name:	ECSi, Inc.	**Cylinder Number:**	SA25925
Stock or Analyzer Tag Number:	N/A	**Product Class:**	Certified Standard
Customer Reference:	Verbal- Dan	**Cylinder - Contents[1]:**	28 CF @ 2000 PSI
MESA Reference:	104448	**Cylinder-CGA:**	A006-HP-BR/350
Date of Certification:	4/20/2016	**Analysis Method:**	GC-TCD/FID
Recommended Shelf Life:	2 Years	**Preparation Method:**	Gravimetric

Component	Requested Concentration[2]	Reported Concentration[2,3]
Ethylene Oxide	50 ppm	48.8 ppm
Nitrogen	Balance	Balance

Authorized Signature:

1. The fill pressure shown on the COA is as originally quoted. The fill pressure measured by the customer may differ from the fill pressure originally quoted due to temperature effects, compressibility of the individual components when blended together in the cylinder, gauge accuracy or reduction in content volume before shipping as a result of samples withdrawn for laboratory QC necessary to ensure product quality.
2. Unless otherwise stated, concentrations are given in molar units.
3. Vapor pressure mixes are blended at a sufficiently low pressure so as to eliminate phase separation under most low temperature conditions encountered during transport or storage. However, it is generally recommended that cylinders containing vapor pressure restricted mixes be placed on the floor in a horizontal position and rolled back and forth to improve homogeneity of the gas phase mixture before being put into service.

Analytical Gas Standards are prepared and analyzed using combinations of NIST traceable weights, SRM's provided by NIST, or internal gas standards that have been verified for accuracy using procedures published by the US-EPA. Pure gases are analyzed and certified for purity using minor component Analytical Gas Standards prepared according to the methods specified above. Balances are calibrated to NIST test weights covered by NIST test number 822/256175/96. Reference Certification #'s: 163/W, 830/N and 3280. Calibration methods are in conformance with MIL-STD 45662A.

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